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## ORIGINAL RESEARCH

## ADR/DRUG INTERACTIONS

**1. Trends of sources of adverse drug reactions reports in a spontaneous reporting system in Taiwan** Yuk-Ying Chan, MS[1], *Shih-Chieh Shao, MS*[2]; [1]Department of Pharmacy, Linkou Chang Gung Memorial Hospital, Linkou, Taiwan [2]School of Pharmacy, Institute of Clinical Pharmacy and Pharmaceutical Sciences, College of Medicine, National Cheng Kung University, Tainan, Taiwan

**INTRODUCTION:** Analyses of adverse drug reaction (ADR) reports were clinically relevant issues to avoid unintended outcomes of patients. Understanding the trends of sources of ADR reports could help us to develop a strategy to improve underreporting of ADR.

**RESEARCH QUESTION OR HYPOTHESIS:** To investigate the trends of sources in a spontaneous ADR reporting system in Taiwan.

**STUDY DESIGN:** Observational study.

**METHODS:** We extracted the data from the spontaneous ADR reporting system of the Chang Gung Medical Foundation (CGMF), which consists of 2 medical centers, 2 regional hospitals and 3 district hospitals in Taiwan, from 2005-2014. We classified the sources by following categories: 1) level of hospitals: medical centers, regional hospitals and district hospitals 2) settings: inpatients, outpatients and emergent rooms, and 3) healthcare providers: clinicians, nurses and pharmacists. We calculated the proportions of each category and compared proportions in 2005 and 2014 with chi-square tests considering 2-sided P value <0.05 to be statistically significant for examining whether the changes existed over time.

**RESULTS:** We identified a total of 19,056 ADR reports and the number of reports increased 14.84% during study period. Most of ADR reports were from inpatient (50.3%), medical centers (63.6%) and clinicians (66.7%). Between 2005 and 2014, we found the proportion of sources of ADR reports from medical centers and outpatients increased from 57.1% to 65.9% (p<0.01) and 46.6% to 51.9% (p=0.02), respectively; however, regional hospitals and inpatients accounted for decreased proportion of sources of ADR reports from 42.9% to 27.4% (p<0.01) and 48.8% to 44.2% (p=0.008), respectively. No significant changes of the proportion of ADR reports from different healthcare providers.

**CONCLUSION:** We found the proportion of sources of ADR reports changed over time, especially for decreased proportion of regional hospitals and inpatients. It warranted further investigations to identify the factors affecting the reporting rate.

**2. Overriding high priority drug-drug interaction alerts in a newly implemented commercial computerized provider order entry system: override appropriateness and adverse drug events** *Heba Edrees, Pharm.D.*[1], Mary Amato, Pharm.D., MPH[2], Adrian Wong, Pharm.D., MPH[3], Diane Seger, RPh[4], David Bates, MD, MSc[5]; [1]School of Pharmacy, MCPHS University, Boston, MA [2]Department of Pharmacy Practice, MCPHS University, Boston, MA [3]The Center for Patient Safety Research and Practice; Division of General Internal Medicine and Primary Care, Brigham and Women's Hospital, Boston, MA [4]The Center for Patient Safety Research and Practice; Division of General Internal Medicine and Primary Care, Brigham and Women's Hospital, Boston, MA [5]Harvard Medical School, Boston, MA

**INTRODUCTION:** Our institution formerly utilized an in-house developed electronic health record (EHR) with clinical decision support (CDS) that incorporated tiered drug-drug interaction (DDI) alerts, which included hard-stops for highest severity DDIs. Transition to a commercial system with CDS that allows all alerts to be overridden raises concern that potentially serious DDIs could reach patients and increase risk of adverse drug events (ADEs).

**RESEARCH QUESTION OR HYPOTHESIS:** To compare the rate of CDS alert overrides and associated ADEs by EHR.

**STUDY DESIGN:** Retrospective study of overridden high-priority DDI alerts from inpatient and outpatient settings.

**METHODS:** Alerts assessed were the highest severity DDIs from our legacy system and additional DDIs identified from clinical experience and literature review. All highest severity alert overrides plus a random sample of additional overrides (n = 564 total) were evaluated by two independent reviewers for override appropriateness, using predetermined criteria developed by a multidisciplinary group. For overridden alerts that resulted in medication administration, charts were reviewed to identify potential ADEs. Chi Square test was used to compare ADE rate by appropriateness of overrides.

**RESULTS:** A total of 20,045 alerts occurred for the included DDIs. Of 16,011 alerts that were seen by the provider, 15,318 were overridden (95.7%). Overrides occurred in 193 (87.3%) of the highest severity alerts and 15,125 (95.8%) of other DDIs. Override appropriateness was 45.4% overall, 0.5% for highest severity and 68.7% for additional alerts. Of alerts that resulted in medication administration (n = 423, 75.0%), 29 (6.9%) ADEs were identified (appropriate override, n = 9 of

  

210 administered (4.3%); inappropriate override, n = 20 of 213 administered (9.4%), p = 0.038).

**CONCLUSION:** Most high priority DDI alerts are overridden, often inappropriately, indicating the need to focus on improving and/or tailoring alerts to reduce alert fatigue. More ADEs occurred with inappropriately overridden alerts.

**3.** A drug-drug interaction study evaluating the effect of multiple doses of ranitidine administered once daily or staggered twice daily on the pharmacokinetics and safety of neratinib in healthy subjects *Kiana Keyvanjah*, *Pharm.D.*[1], Pearl Fang, Ph.D.[1], Blaire Cooke, Pharm.D.[1], Daniel DiPrimeo, MS[1], Jeffrey Pearl, MD[2], Stefan Dyla, Ph.D.[1], Daniel Hunt, Ph.D.[1], Igor Rubets, Ph.D.[3], Alvin Wong, Pharm.D.[1], David Martin, Ph.D.[1]; [1]Puma Biotechnology Inc., Los Angeles, CA [2]Celerion, Lincoln, NE [3]Certara USA Inc, Princeton, NJ

**INTRODUCTION:** The irreversible pan-HER tyrosine kinase inhibitor neratinib (Puma Biotechnology Inc), similar to most protein kinase inhibitors (PKIs), is a weak base with pH-dependent solubility. Acid-reducing agents increase gastric pH from 1.5–3 to 5–6, leading to reduced absorption of PKIs. As acid-suppressive therapy is prevalent in cancer patients, we evaluated ranitidine in combination with neratinib, which is known to have solubility and permeability-dependent absorption.

**RESEARCH QUESTION OR HYPOTHESIS:** To evaluate the effects of ranitidine, an H2-receptor antagonist, given QD with neratinib, or BID in a staggered fashion, on the pharmacokinetics and safety of neratinib.

**STUDY DESIGN:** Single-center, open-label, randomized, three-period, two-sequence crossover.

**METHODS:** Forty healthy subjects received a single oral dose of neratinib 240 mg during Period 1 and in combination with multiple doses of ranitidine 300 mg QD or multiple doses of ranitidine 150 mg BID during Periods 2 and 3, with a 7-day washout between periods. Pharmacokinetic sampling was performed for 96 hours following each neratinib dose.

**RESULTS:** Mean neratinib exposure ($C_{max}$, $AUC_{0-last}$, $AUC_{0-inf}$) was ~50% lower with both ranitidine schedules versus neratinib alone, with respective values of 67.3 ng/mL, 1054 ng•h/mL and 1163 ng•h/mL for neratinib alone; 30.5 ng/mL, 517 ng•h/mL and 616 ng•h/mL for neratinib plus ranitidine 300 mg QD; and 39.6 ng/mL, 712 ng•h/mL and 810 ng•h/mL for neratinib plus ranitidine 150 mg BID (staggered). Geometric mean ratios and 90% confidence intervals for all three parameters fell outside the equivalence range. Neratinib exposure was greater with the staggered schedule. Treatment-emergent adverse events of grade 1 and grade 2 severity were reported by 30% and 7.5% of patients, respectively.

**CONCLUSION:** Co-administration of ranitidine with neratinib significantly reduces exposure to neratinib in healthy subjects; staggering the dose of ranitidine (150 mg BID) limits the impact of ranitidine on neratinib exposure.

**4. The impact of an electronic best practice alert to prevent iatrogenic hyperkalemia** *Christine A. Hamby*, *Pharm.D.*[1], Jose Alcantara-Contreras, MD[2]; [1]Department of Pharmacy, Rochester General Hospital, Rochester, NY [2]Department of Medicine, Rochester General Hospital, Rochester, NY

**INTRODUCTION:** Potassium supplements are commonly ordered for hospitalized patients; however, careful monitoring is needed as patient's needs fluctuate with changes in medications and disease states. Hyperkalemia has been reported in up to ten percent of hospitalized patients and may lead to serious adverse effects such as cardiac arrhythmias and in-hospital mortality.

**RESEARCH QUESTION OR HYPOTHESIS:** Will clinical decision support reduce the rate of iatrogenic hyperkalemia?

**STUDY DESIGN:** Retrospective

**METHODS:** A chart review was conducted to identify patients who received potassium supplementation when their serum potassium was greater than 4.5 mEq/L. The nurse was alerted with the potassium value and reminded to notify a prescriber to confirm the order. The alerts were delivered by MAR instructions that appear for every patient regardless of potassium level (5 weeks), followed by a best practice alert (BPA) that appears only when the threshold is reached and requires a response from the nurse (11 weeks).

**RESULTS:** The mean number of events (potassium administration when serum potassium is greater than 4.5 mEq/L) per week was 32.7 in the baseline period, 22.4 with MAR instructions, and 7.8 with the BPA. Following BPA deployment the number of events was more than two standard deviations below baseline and this result was sustained throughout the 11-week post-BPA period. Records were reviewed for 20 patients who received potassium despite a serum potassium value of greater than 4.8 mEq/L. The most common reasons were diabetic or alcoholic ketoacidosis (5), pediatric patients with higher potassium threshold (4), hemolyzed samples (4), and maintenance fluid for patients who were not eating (3). In five cases the prescriber continued potassium but reduced the dose. No patients required treatment for hyperkalemia.

**CONCLUSION:** The use of the BPA resulted in a significant reduction in the administration of potassium to patients with a serum potassium greater than 4.5 mEq/L.

**5. Risk factors associated with adverse drug reactions among critically ill pediatric patients** Kico Tso, B.Pharm, Mo Ki Wong, B.Pharm, Yin Ting Cheung, B.Sc. (Pharm), Ph.D., Joyce You, Pharm.D., BCPS and *Celeste Ewig*, *Pharm.D.*; School of Pharmacy, The Chinese University of Hong Kong, Shatin, New Territories, Hong Kong

**INTRODUCTION:** Critically ill pediatric patients often require multiple medications leading to a higher risk of adverse drug reactions (ADRs). The incidence, nature and potential risk factors for the occurrence of an ADR this vulnerable population are not well studied.

**RESEARCH QUESTION OR HYPOTHESIS:** What characteristics among critically ill pediatric patients are factors associated with the occurrence of an ADR?

**STUDY DESIGN:** We conducted a retrospective chart review among patients aged 28 days to 18 years old admitted to the Pediatric Intensive Care and High Dependency Unit from January 1, 2016 to December 31, 2017.

**METHODS:** Our primary outcome was the occurrence of an ADR among patients during admission in the PICU. Patient and ADR characteristics were collected and evaluated for causality and clinical severity using the Naranjo Scale and Hartwig's Severity Assessment Scale respectively. Descriptive statistics was used to determine incidence and nature of ADRs while a multivariate logistic regression was performed to evaluate potential risk factors.

**RESULTS:** Our study included 295 patients (male = 56%) with a median age of 4 (IQR 1-8). We identified 267 ADRs resulting in an incidence of 34.8%. Majority of ADRs were due to anti-infectives (64.4%), chemotherapeutic agents (16.3%), and opioids (13.3%). ADRs presented as elevated alanine aminotransferase (38.6%), hypokalemia (19.3%) and bone marrow suppression (12.0%). Most (73.4%) were Type A reactions, and 114 (48.9%) had a severity level 2. Potential risk factors for an ADR include an admission Glasgow Coma Score <8 (OR= 2.81; $p$ = 0.027), serum urea >6.6mmol/L (>39.6mg/dl) upon admission (OR= 8.82; $p$<0.001) and the use of 1 anti-infective (OR=1.49; $p$<0.001).

**CONCLUSION:** Factors associated with the occurrence of ADRs include a low level of consciousness, poor renal function or hemodynamic status, and the use of multiple anti-infectives. These findings may offer clinical guidance in the implementation of measures to further improve medication safety within this patient population.

**6. The effect of sulfonylureas with concomitant antimicrobials on hypoglycemia in patients with type2 diabetes mellitus** *Miyoung Ock, B.S. Pharm*[1], SERA Lee, B.S. Pharm[2], Hyunah Kim, Pharm.D., BCPS[3]; [1]College of Pharmacy, Sookymyung Women's University, Seoul, Korea, Republic of (South) [2]College of pharmacy, Sookmyung Women's University, Seoul, Korea, Republic of (South) [3]College of Pharmacy, Sookmyung Women's University, Seoul, Korea, Republic of (South)

**INTRODUCTION:** Previous studies revealed that concurrent use of sulfonylureas (SUs) and antimicrobials is common, which could increase the risk of hypoglycemia. Hypoglycemia associated with drug-drug interactions (DDIs) may cause important morbidity and increase healthcare cost burden.

**RESEARCH QUESTION OR HYPOTHESIS:** Certain antimicrobials concurrently used with sulfonylureas could increase the risk of hypoglycemia.

**STUDY DESIGN:** We conducted a retrospective cohort study using 10-year National Health Insurance Service-National Sample Cohort database in Korean population (n=1,025,340) from 2004 to 2013.

**METHODS:** Type 2 diabetes patients who began receiving SUs for the first time without a history of receiving a prescription for SUs and diagnosis of hypoglycemia during the preceding year and age ≥ 20 years were included. This study investigated the number of patients diagnosed with hypoglycemia in two different groups, patients treated with SUs with or without antimicrobials. We included only antimicrobial prescriptions within first 30 days after initiating SUs in order to minimize immortal time bias. Different risk ratings of severity in DDIs, level X, D or C in Lexi-Interact online and major or contraindicated severity level in Micromedex were included. SAS version 9.4 was used for data analysis.

**RESULTS:** From the 74,061 patients who had type 2 diabetes mellitus, we identified 43,711 new SUs users. A total of 33,917 patients met the study inclusion criteria. The largest age group was 50-54 years old (4,579, 13.5%) and 19,131 patients (56.4%) were male. The prevalence of hypoglycemia was 1.9 times more in co-medication group; hypoglycemia was observed in 55/3,054 (1.8%) of the SUs with antimicrobials group and in 289/30,863 (0.9%) of the SUs without antimicrobials group. Among patients who used the SUs with antimicrobials, the hypoglycemic episodes were commonly occurred in ofloxacin (36.4%), ciprofloxacin (20.0%), fluconazole (18.2%) users, respectively.

**CONCLUSION:** Hypoglycemia occurred more frequently in patients prescribed SUs and antimicrobials concurrently.

**7E. A potential drug interaction of quetiapine in critically ill patients in Korea** *SERA Lee, B.S. Pharm*[1], Miyoung Ock, B.S. Pharm[2], Hyunah Kim, Pharm.D., BCPS[3]; [1]College of pharmacy, Sookmyung Women's University, Seoul, Korea, Republic of (South) [2]College of Pharmacy, Sookymyung Women's University, Seoul, Korea, Republic of (South) [3]College of Pharmacy, Sookmyung Women's University, Seoul, Korea, Republic of (South)

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**8. Risk of adverse events with long-term phenazopyridine use for radiation cystitis** Stephanie Shore, Pharm.D., Sara Britnell, Pharm.D., BCPS and *Jamie Brown, Pharm.D., BCPS, BCACP*; Pharmacy Service, Durham VA Health Care System, Durham, NC

**INTRODUCTION:** Phenazopyridine currently lacks robust safety and efficacy data for use beyond 15 days. Yet, it is often used in varying durations for supportive care for cancer patients with radiation-induced cystitis.

**RESEARCH QUESTION OR HYPOTHESIS:** The primary objective of this study was to compare the incidence of composite adverse drug reactions (ADRs) in patients receiving long-term phenazopyridine (>14-day supply) compared to a matched comparator group. The secondary objective was to compare the incidence of individual ADRs, ED visits, hospitalizations, and diagnosis of hepatocellular or colorectal cancer.

**STUDY DESIGN:** retrospective cohort study

**METHODS:** This study compared adverse events among cancer patients with and without phenazopyridine exposure. Included patients received radiation and at least one chronic medication between July 1, 2008 and June 30, 2017. The phenazopyridine group also received >14-day supply of phenazopyridine during the study

period. Patients were matched based on gender, age (± 5 years), cancer diagnosis, and palliative or curative treatment intent. Data collection occurred at baseline, during the time of presumed exposure, and through the end of the study period for surveillance purposes.

**RESULTS:** A total of 272 patients received phenazopyridine for >14-day supply during the study period. Of these, 90 patients were included and matched to an equal number of patients in the comparator group. The included patients were similar between groups and were largely male with a diagnosis of prostate cancer. The majority of patients received between a 30 and 60-day supply of phenazopyridine. There were a total of 13 ADRs in the phenazopyridine group and 18 in the comparator group (P=0.32). No differences were identified between the phenazopyridine and comparator groups for any of the secondary endpoints.

**CONCLUSION:** There was no difference in ADRs among patients receiving phenazopyridine for >14 days compared to a matched comparator group. The overall incidence of adverse events in both groups was low.

## ADULT MEDICINE

**9. Effects of an electronic lifestyle intervention on overweight and obese patients** *Rachel Franks, Pharm.D., BCACP, CDE*[1], Courtney Cantrell, Pharm.D.[2], Kristina Dogoda, Pharm.D.[2], Amanda Elchynski, Pharm.D.[2]; [1]Department of Pharmacotherapeutics and Clinical Research, University of South Florida College of Pharmacy, Tampa, FL [2]Tampa, FL

**INTRODUCTION:** Lifestyle interventions have a beneficial effect on eating behavior and long-term weight loss in obese adults. The use of technology-based weight reduction programs have been shown to be efficacious in treating obese adults, however, the quantity and frequency remains unclear.

**RESEARCH QUESTION OR HYPOTHESIS:** Educational and motivational materials delivered weekly via email will improve the knowledge and level of motivation of overweight and obese patients improving their ability to lose weight.

**STUDY DESIGN:** Randomized, single-blinded, controlled trial

**METHODS:** University of South Florida General Internal Medicine Clinic patients ages 18-65 years with a BMI over 25 were randomized to the treatment or control group. Participants were excluded if they were taking warfarin, did not have access to a scale or email account, could not read English, were taking insulin or a sulfonylurea, or were pregnant. The intervention group received weekly educational and motivational emails for a total of 12 weeks. The control group received one email at the start of the study with a condensed version of weekly emails. Both groups completed pre- and post-surveys to determine their knowledge on healthy lifestyle changes, level of motivation, and body weight.

**RESULTS:** Of the 23 participants enrolled, 8 completed the final survey; 3 in the intervention and 5 in the control group. There were no significant differences with regard to knowledge or motivation at the end of the study, however, there was a significant reduction in weight reported by the intervention group compared to the control group (-8 lbs vs +2.6 lbs; P = 0.009).

**CONCLUSION:** Patients who receive weekly educational and motivational emails are more likely to report weight loss. In order to increase the validity of this study, a larger sample size would need to be implemented and patients' weight should be measured rather than reported.

**10. A pilot study evaluating potential predictors of readmission in hospitalized medicine patients** *Henry Okoroike, BS*, Mathew Thambi, Pharm.D., BCPS, MPH, Wenchin Li, BS; College of Pharmacy, University of Illinois at Chicago, Chicago, IL

**INTRODUCTION:** Many patients are readmitted to hospitals shortly after discharge, at a significant cost. A fifth of Medicare beneficiaries discharged were re-hospitalized within 30 days at a cost to Medicare estimated at $17.4 billion. Identifying patients with a high readmission risk is important for allocating resources in a manner that is targeted and cost-effective.

**RESEARCH QUESTION OR HYPOTHESIS:** The objective of this pilot study was to test a survey for predicting readmission in conjunction with co-morbidity indices. Our hypothesis was that certain characteristics of a patient can predict their risk of readmission or ED visit after discharge that are measurable in a time-sensitive clinical setting.

**STUDY DESIGN:** The survey study consists of validated as well as investigator developed survey instruments to assess the following: health literacy, numeracy, medication adherence, self-efficacy, and tolerance.

**METHODS:** Subjects admitted to Internal Medicine at University of Illinois were screened for eligibility. If consent was granted, subjects participated in a one-time survey that took about 20 minutes to complete. Approximately 30 days after discharge, subjects were contacted via phone to ask how many admissions and ED visits they had since discharge and the information was also recorded from their electronic medical record. A regression analysis was done to determine the predictive ability of the survey components along with co-morbidity indices including LACE, CCI, and CPS.

**RESULTS:** In total, 40 subjects were enrolled and the overall 30-day readmission rate by EMR was 25%. A backwards regression analysis of key variables had an adjusted R-squared of 0.83 and p-value of 0.001. Some of the variables that were included in the final regression were gender, medication insurance, CCI score, REALM-R scores, and modified General Self Efficacy Scale score.

**CONCLUSION:** Based on the results of the pilot, certain characteristics can potentially predict a patient's risk of readmission but will need to be verified in a larger, appropriately powered study.

**11. Evaluation of benzodiazepine use in patients with post-traumatic stress disorder** *Sarah G. Kessler, Pharm.D.*, Stephanie Coveart, Pharm. D., BCPS, BCPP; Department of Pharmacy, Memphis Veterans Affairs Medical Center, Memphis, TN

**INTRODUCTION:** Post-traumatic stress disorder (PTSD) is the most common psychological consequence after a traumatic event. Veterans Affairs (VA) and Department of Defense (DoD) guidelines recommend sertraline, paroxetine, fluoxetine, and venlafaxine as preferred agents for the treatment of PTSD. The use of benzodiazepines for treatment and augmentation of therapy is not recommended due to low quality of evidence and increased risk of adverse effects.

**RESEARCH QUESTION OR HYPOTHESIS:** Evaluate the prevalence of benzodiazepine use in patients with PTSD but not on VA/DoD recommended psychotropic therapy.

**STUDY DESIGN:** Retrospective, single-center, chart review.

**METHODS:** Data was collected from November 2017 through April 2018 using medical records at the Memphis Veterans Affairs Medical Center. Patients were included if they had an ICD-10 diagnosis of PTSD and an active prescription for a benzodiazepine. The primary end point was the number of patients on a benzodiazepine not taking a VA/DoD recommended psychotropic agent for the treatment of PTSD. Secondary endpoints included benzodiazepine indication, duration of therapy, average benzodiazepine daily dose, and the percentage of patients adequately titrated on recommended psychotropic therapy (defined as ≥ 50% of the maximum total daily dose).

**RESULTS:** A total of 189 patients met study inclusion criteria, with nearly half (49%) having an active prescription for clonazepam. Of the 189 patients, 100 patients underwent further chart review. 94 patients were taking a SSRI or SNRI. Of these, 49 (52%) were on a VA/DoD recommended psychotropic therapy. The average duration of benzodiazepine use was 7 years and the average total daily dose in diazepam equivalents was 14 milligrams. The most common indications were anxiety followed by sleep.

**CONCLUSION:** These findings suggest that among patients receiving a benzodiazepine with a concomitant diagnosis of PTSD, roughly half are not on VA/DoD recommended psychotropic therapy.

**12. Evaluation of the impact of an inpatient hyperglycemia protocol on glycemic control** Haley N. Ilcewicz, Pharm.D., *Erin K. Hennessey, Pharm.D., BCPS*, Carmen B. Smith, Pharm.D., BCPS; St. Louis College of Pharmacy/Mercy Hospital St. Louis, St. Louis, MO

**INTRODUCTION:** Inpatient hyperglycemia is associated with poor outcomes. Existing research assessing inpatient hyperglycemia protocols has shown improvements in average blood glucose levels with inconsistent results regarding rates of hypoglycemia and hyperglycemia.

**RESEARCH QUESTION OR HYPOTHESIS:** The implementation of an inpatient hyperglycemia protocol is associated with improved glycemic control.

**STUDY DESIGN:** Single center, retrospective cohort.

**METHODS:** Patients in non-critical care units requiring insulin administration for glycemic control were included. The inpatient hyperglycemia protocol was implemented in November 2013. Two cohorts, a pre-protocol implementation group (January – July 2013) and a post-protocol implementation group (January – July 2017), were compared. The primary outcome was to compare the incidence of blood glucose values within 70-180 mg/dL over a 72-hour period between groups. Key secondary outcomes included the incidence of hypoglycemia (less than 70 mg/dL), severe hyperglycemia (greater than 300 mg/dL), total insulin use, and hospital length of stay. Chi-square or Fisher's Exact were performed for categorical data and Student's t-test for continuous data using SPSS software.

**RESULTS:** A total of 500 patients were included; 250 in the pre-protocol group and 250 in the post-protocol group. The primary outcome was significantly improved following protocol implementation (54.2% vs. 58.4%, p = 0.001). Compared to the pre-protocol group, the post-protocol group had lower incidence of hypoglycemia (3.1% vs. 1.2%, p < 0.001), severe hyperglycemia (9.9% vs. 6.7%, p < 0.001), less total insulin use (1.1 units/kg vs. 0.6 units/kg, p < 0.001), and shorter length of stay (5.1 days vs. 3.7 days, p < 0.001).

**CONCLUSION:** The implementation of an inpatient hyperglycemia protocol was associated with improved glycemic control, decreased incidence of both hypoglycemia and severe hyperglycemia, and less total insulin use.

**13. Unintentional prescription persistence of medications discontinued at hospital discharge** *T. Michael Farley, Pharm.D., BCPS, BC-ADM*[1], Martin Izakovic, MD, Ph.D.[2]; [1]Department of Pharmacy Practice and Science, University of Iowa, Iowa City, IA [2]Department of Hospitalist Medicine, St. Elizabeth University, Bratislava, Slovakia

**INTRODUCTION:** Medication discrepancies are prevalent at various transitions of care. Medication changes at hospital discharge may be misunderstood by the patient or not conveyed throughout the healthcare system. It is unknown how often medications intended to be stopped by the discharging hospital provider are still active at the pharmacy and/or filled by the patient after discharge.

**RESEARCH QUESTION OR HYPOTHESIS:** To quantify how often medications intended to be stopped by the discharging hospital provider are still active at the pharmacy and/or filled by the patient after discharge.

**STUDY DESIGN:** A pilot, retrospective observational study that reviewed patient's discharge records from Mercy Hospital Iowa City and the patient's outpatient pharmacy

**METHODS:** Discharge medication lists were evaluated for discontinuation or substitution of medication therapy. If a patient met criteria and enrolled the patient's pharmacy was called at 5-10 days and 25-35 days post discharge to determine if prescriptions were active/refilled.

**RESULTS:** In this study 17/22 (77%) of discontinued medications were still active for sixteen patients at follow up call to the pharmacy 5-10 days after hospital discharge. Some discharge prescriptions included a note to the pharmacist to discontinue prior medications when starting a new prescription; of these, 3/7 (43%) were active at 5-10 days. When compared with those that did not include any instructions 14/15 (93%) were active (p=.001). As of 30 days post-discharge, 4/16 (25%) medications that were discontinued at discharge by the hospital physician had been refilled since discharge.

**CONCLUSION:** Discontinued medications are often still active at the outpatient pharmacy (17/22, 77%) after discharge. The prescriber adding a note to the outpatient pharmacist about stopping a medication (a pseudo "prescription to discontinue") was associated with a lower risk of unintentional prescription persistence. At 30 days after discharge, 4/16 (25%) discontinued medications had been refilled since discharge, representing potential medication errors.

**14. The clinical impact of intravenous calcium utilization in hyperkalemia** Sahar Torabi, Pharm.D., Eli Deal, Pharm.D., BCPS, Christina Anderson, MD, *William Call, Pharm.D., BCPS*; Barnes-Jewish Hospital, St. Louis, MO

**INTRODUCTION:** Guidelines recommend intravenous (IV) calcium for patients with hyperkalemia and EKG changes; however, its use in patients without EKG changes is less clearly defined.

**RESEARCH QUESTION OR HYPOTHESIS:** Does the use of IV calcium in the setting of hyperkalemia without EKG changes improve clinical outcomes?

**STUDY DESIGN:** Single-center, retrospective, cohort study

**METHODS:** Adult patients admitted to Barnes-Jewish Hospital between July 1, 2015 and June 30, 2016 with serum potassium > 5.0 mEq/L and EKG without acute changes were included. Patients receiving IV calcium plus potassium lowering agents were compared to those receiving potassium lowering agents alone. Propensity score matching was performed using the covariates age, Charlson Comorbidity Index, intensive care unit status, and serum potassium level. The primary outcome was inpatient mortality. Secondary outcomes included hospital length of stay, time to hyperkalemia resolution, hyperkalemia resolution at 24 hours, thirty-day mortality, hypercalcemia at 24 hours, and subsequent EKG changes.

**RESULTS:** A total of 226 patients were included in the propensity matched samples, 113 in each group. Inpatient mortality was found to be 13% in the IV calcium group and 15% in the potassium lowering agents group (p=0.703), with a respective thirty-day mortality of 18% and 24% (p=0.251). The median time to hyperkalemia resolution was 15.7 hours and 16.2 hours, respectively (p=0.745), with 62% of all patients having hyperkalemia resolution at 24 hours (p=1.00). The incidence of hypercalcemia at 24 hours was 12% and 11%, respectively (p=0.832). In 69 patients with a follow-up EKG, subsequent EKG changes were found in 5 patients (14%) receiving IV calcium and 11 patients (33%) receiving potassium lowering agents alone (p=0.056).

**CONCLUSION:** The use of IV calcium in patients without EKG changes secondary to hyperkalemia did not improve clinical outcomes. In a limited cohort of patients with a follow-up EKG, there was a lower incidence of subsequent EKG changes in patients who received IV calcium.

**15. Utility of anti-Xa-guided enoxaparin dosing in venous thromboembolism prophylaxis and treatment** *Emmeline Tran, Pharm.D.*[1], Erin Weeda, Pharm.D.[2]; [1]Medical University of South Carolina, Charleston, SC [2]College of Pharmacy, Medical University of South Carolina, Charleston, SC

**INTRODUCTION:** Routine monitoring of anti-Xa concentrations with the use of low molecular weight heparins (LMWHs) in the prophylaxis and treatment of venous thromboembolism (VTE) is generally unnecessary due to the predictable dose-response relationship. Additionally, major trials evaluating LMWHs did not use anti-Xa concentrations to direct dosing, and target anti-Xa concentrations are not clinically validated.

**RESEARCH QUESTION OR HYPOTHESIS:** To examine the utility of anti-Xa monitoring with the use of enoxaparin in the prophylaxis and treatment of VTE

**STUDY DESIGN:** Retrospective cohort analysis

**METHODS:** This retrospective chart review included patients at least 18 years of age or older who received at least one anti-Xa level and regularly scheduled dose of enoxaparin for VTE prophylaxis or treatment as an inpatient from February 1, 2017 to February 28, 2018 at the Medical University of South Carolina. Patients were excluded if creatinine clearance (CrCl) could not be calculated using the Cockcroft-Gault equation due to missing serum creatinine, weight, or height; the patient had a diagnosis of pregnancy; or the dose was prescribed as a one-time order. The primary outcome was the frequency of fixed-dose enoxaparin corresponding with an initial therapeutic anti-Xa concentration. Descriptive statistics were applied to all data.

**RESULTS:** The study examined 122 patients with 129 unique admissions. A total of 129 initial anti-Xa levels were obtained. Of which, 71% (n=92) were drawn appropriately. Based on renal function and weight, 62% (n=42) of appropriate enoxaparin doses administered corresponded with a therapeutic anti-Xa level, 26% (n=18) of doses with a supratherapeutic level, and 12% (n=8) of doses with a subtherapeutic level.

**CONCLUSION:** In relation to dose, anti-Xa levels had an unpredictable nature in patients receiving enoxaparin for VTE prophylaxis or treatment. More studies are needed to determine the role of utilizing anti-Xa levels for monitoring enoxaparin in clinical practice.

## AMBULATORY CARE

**16. Identifying medication inaccuracies in a community health center electronic health record through pharmacist led medication reconciliation** *Katherine Alfond, Student Pharmacist*[1], Meissane Benbrahim, Student Pharmacist[1], Olivia Iskaros, Student Pharmacist[1], Michael Conley, Pharm.D., BCACP[2]; [1]Northeastern University, Boston, MA [2]Harbor Health Services, Inc, Mattapan, MA

**INTRODUCTION:** Pharmacists play an important role in medication reconciliation (MR) to ensure the accuracy of a patient's electronic health record (EHR). An accurate medication list is important to prevent drug related problems and improve patient care, but studies have shown that incorrectly documented medications is a common discrepancy in the EHR. However, little research has been conducted in community health centers to support this relationship.

**RESEARCH QUESTION OR HYPOTHESIS:** This study aims to investigate the accuracy of a patient's medication list in the EHR and determine the most common discrepancies discovered after pharmacist led MR at a Federally Qualified Health Center in Boston, MA.

**STUDY DESIGN:** A retrospective cross-sectional study was performed.

**METHODS:** Participants were 18 years or older, visited their primary care provider from March 2015 to April 2017, and had MR performed by a clinical pharmacist or pharmacy student during the same visit. Demographics and medication discrepancies were extracted from the pharmacy encounter and documented in the EHR during the visit. Descriptive statistics were used to analyze the data.

**RESULTS:** Of the 236 patients were included for analysis, 206 (87.3%) had at least one medication discrepancy in the EHR. 527 medications were discontinued and 237 medications were added. The most common discontinued class of medications was anti-infectives with 69 (13.1%) discontinuations. Over-the-counter (OTC) vitamins/minerals/herbals/supplements were the most commonly added class of medications with 82 (34.6%) additions.

**CONCLUSION:** Despite the Joint Commission listing MR as a national patient safety goal, medication lists in the EHR remain largely inaccurate. Pharmacists provide value to patient care by applying their clinical knowledge to conduct MR in order to reduce the amount of discrepancies in EHR and therefore improve patient care. Additionally, as medication experts, pharmacists can educate providers on the importance of maintaining an updated medication list.

**17E. A pharmacists role in transitions of care settings as part of a patient care management team to decrease re-admissions** *Klodiana Myftari, Pharm.D.*[1], Kavita Parikh, Pharm.D. Candidate[2]; [1]Department of Pharmacy Practice, Midwestern University, Downers Grove, IL [2]Midwestern University, Downers Grove, IL

Presented at the Annual Meeting of Pharmacy Quality Alliance, Baltimore, MD, Mary 17-20, 2017.

**18. Healthcare utilization, adherence, efficacy, and safety of direct oral anticoagulants (DOACS) versus warfarin in obese patients in an academic medical center primary care clinic** *Christine Kelso, Pharm.D.*; Department of Pharmacy, Barnes-Jewish Hospital, St. Louis, MO

**INTRODUCTION:** Direct oral anticoagulant (DOAC) use in obese patients is concerning due to lack of representation in clinical trials. Several organizations recommend avoiding DOACs in patients with high BMI and/or weight above 120kg. Comparing real-world outcomes of DOACs and warfarin in obesity may guide prescribing and treatment planning.

**RESEARCH QUESTION OR HYPOTHESIS:** Do differences exist between warfarin and DOACs in healthcare utilization, bleeding events, VTE events, and adherence to therapy in obese adults?

**STUDY DESIGN:** Retrospective chart review of patients prescribed warfarin or DOACs by primary care physicians for any indication between 1/1/17 and 6/15/17.

**METHODS:** Data obtained through chart review: renal function, BMI, weight, insurance; clinic and ER visits, hospitalizations; refill records for Medicaid patients, and bleeding events. Student's t-test and Fisher's exact tests were used to evaluate statistical significance (alpha set at 0.05).

**RESULTS:** Two hundred fifty-one patients were prescribed warfarin; 184 were prescribed DOACs. Twenty-one percent of warfarin patients and 22.8% of DOAC patients weighed >120kg. Notably, 61.4% of DOAC patients had BMI > 30kg/m$^2$. Warfarin patients had lower average number of ER visits in the last year compared to apixaban (0.98 vs. 2.67, p=0.002) and rivaroxaban (0.98 vs. 2.7, p=0.003). No significant differences between warfarin and DOACs were found in VTE rates (7.5% vs. 7.1%, p=0.99). Warfarin patients had higher bleeding rates compared to DOACs (13.2% vs. 4.8% for weight > 120kg; 7.5% vs. 5.3% for BMI over 30); however, differences were not statistically significant. Average medication possession ratio (MPR) for patients > 120kg with Medicaid was higher for warfarin (105.4% vs. 71.7%, p=0.016).

**CONCLUSION:** DOACs are frequently prescribed to obese patients despite lack of evidence to support use in this group. Closer consideration for use and more frequent follow-up in obese patients is warranted given poorer adherence and more frequent ER visits compared to warfarin.

**19. Pharmacist-led management of obesity in a rural health, family medicine clinic** *Jennifer Clements, Pharm.D., FCCP, BCPS, CDE, BCACP*; Presbyterian College School of Pharmacy, Clinton, SC

**INTRODUCTION:** One in every three adults in the U.S. has obesity, defined as a body mass index (BMI) 30 kg/m2. There is evidence supporting the role of pharmacists in community settings for obesity management and limited evidence as a member of multidisciplinary teams. However, there are no publications defining the role of a pharmacist as a lifestyle coach in a rural health, family medicine center for obesity management.

**RESEARCH QUESTION OR HYPOTHESIS:** Can a pharmacist have an impact in assisting patients with weight loss in a rural health, family medicine setting?

**STUDY DESIGN:** This study was a prospective, cohort, feasibility trial conducted at a single-site with a targeted sample size of 75 patients.

**METHODS:** Inclusion criteria was adult patients aged 18 to 75 years with BMI 30 kg/m$^2$. Enrolled patients were seen monthly for six months at individual, face-to-face visits that lasted 45-60 minutes with approximately 20-25 minutes on lifestyle modifications. The primary outcome was absolute and percentage change in weight from baseline to six months. Secondary outcomes included changes in BMI and waist circumference. Paired t-test was used for statistical analysis of the primary outcome.

**RESULTS:** During a 14-day screening period, a total of 178 patients were screened. Seventy-five patients were enrolled in the study after agreeing to the informed consent. Among 48 individuals who completed the study, there was a different of -4.4 lbs. over six months (p-value = 0.002). For secondary outcomes, there was a -0.49 kg/m2

change in BMI (p-value = 0.062) and -0.68 inches (p-value = 0.012). While not statistically significant, greater changes in all outcomes were observed among 16 individuals who completed all six monthly visits.

**CONCLUSION:** A pharmacist can have an impact in assisting patients with weight loss, but more studies are warranted to determine the best approach in a pharmacist-led weight management program. Word Count: 293

**20. Evaluation of a pharmacy-driven population health service in a hospital-based, internal medicine clinic** *Joshua Rickard, Pharm.D., BCPS, CDE*[1], Priya Patel, Pharm.D. Candidate[2], Adena Yau, Pharm.D. Candidate[2]; [1]Department of Clinical Health Professions – College of Pharmacy and Health Sciences, St. John's University, Queens, NY [2]St. John's University, Queens, NY

**INTRODUCTION:** Population health is the study of health outcomes and the determinants of health with the aim of improving the health of the population. It supplements the public health by taking a broader range of factors into consideration which impacts the health of the overall human population. New opportunities are emerging for pharmacist involvement in population health management. Pharmacists can identify high-risk patients using electronic medical records and tailor interventions to optimize patient outcomes. One step to improving overall population health is to develop and implement patient focused treatment guidelines which are high in quality and low in cost.

**RESEARCH QUESTION OR HYPOTHESIS:** Are prescribers accepting population health-based recommendations from an ambulatory care clinical pharmacist? Are there any differences in acceptance rates based on provider type? What are the most common recommendations that are being made?

**STUDY DESIGN:** Retrospective, evaluative study of a clinical service that was established May 2017.

**METHODS:** The pharmacists document all population health intervention data in an intervention tracker, called MedKeeper. Data will be downloaded from MedKeeper (May 2017 through April 2018) to evaluate the following: population health recommendation acceptance rate, acceptance rate based on provider type and/or month, and types of interventions made. The data will be manipulated in an excel spreadsheet.

**RESULTS:** There were a total of 905 recommendation made by the pharmacist. Of the 905, 55.3% of recommendations were accepted and of those, 9.1% were modified from the original recommendation. Of the recommendations that were rejected, 22% were justified. PGY-1 medical residents were most likely to accept recommendations (69.5%) and attending physicians were least likely (48.3%). The most common types of recommendations were immunizations, titration of medications, and addition to therapy.

**CONCLUSION:** Overall, the new population health recommendation service has been well received as more than half of the recommendations are accepted.

**21. Narrative literature review to assess implementation fidelity to comprehensive medication management** Nicholas Cox, Pharm.D., BCACP[1], *Kyle Turner, Pharm.D.*[2], Khoi Le, Pharm.D.[3]; [1]Pharmacy Primary Care Services, University of Utah Health, Salt Lake City, UT [2]Department of Pharmacotherapy, University of Utah College of Pharmacy, Salt Lake City, UT [3]University of Utah College of Pharmacy, Salt Lake City, UT

**INTRODUCTION:** The University of Utah Health Pharmacy Primary Care Services (PPCS) has recently engaged in a system-wide implementation of comprehensive medication management (CMM) as the standard of care for all primary care clinics. Previous studies in CMM have demonstrated improvements in clinical, financial, and humanistic outcomes. However, these studies occurred in institutions where pharmacist provision of CMM, based on principles of pharmaceutical care, had long been the standard of practice. As pharmacists nationwide are beginning to implement CMM, little is known about fidelity assessment of practice site implementation leading to replication of positive outcomes. One potential fidelity assessment strategy is to compare medication therapy problems (MTPs) identified and classified by pharmacists to MTPs identified and classified in previously published research.

**RESEARCH QUESTION OR HYPOTHESIS:** How do the MTPs at a health-system initiating CMM services compare to those at institutions with established CMM programs?

**STUDY DESIGN:** This is a narrative literature review and descriptive, retrospective study.

**METHODS:** A narrative literature review was completed to identify published studies evaluating pharmacist provision of CMM services that reported total MTPs identified by category. Study characteristics and MTP outcomes were extracted and summarized; outcomes included institution(s), years of CMM practice, total patients, total MTPs documented, MTP classification framework used, and any clinical, financial, and humanistic outcomes reported. These outcomes were qualitatively compared to seven months of institutional MTP data.

**RESULTS:** Seven studies were included for narrative summary and comparison. Mean MTP outcomes from the seven studies compared to institutional data include: number of MTPs documented, 7732 vs 4631; proportion of MTPs related to Indication, 35% vs 30%; proportion of MTPs related to Effectiveness, 29% vs 34%; proportion of MTPs related to Safety, 19% vs 24%; and proportion of MTPs related to Adherence, 17% vs 12%.

**CONCLUSION:** MTP outcomes from a recent implementation of CMM are similar to MTP outcomes from institutions with established CMM programs.

**22. Increasing access to primary care for rural veterans by leveraging clinical pharmacy specialist providers** *M. Shawn McFarland, Pharm.D.*, Michael Tran, Pharm.D.; PBM Clinical Pharmacy Practice Office, Department of Veterans Affairs, Washington, DC

**INTRODUCTION:** Increasing access to care for rural veterans through integration of clinical pharmacy specialist (CPS) providers has the

opportunity to increase quality of care to rural Veterans who would not otherwise receive care. The CPS is an advanced practice provider with prescriptive authority to provide comprehensive medication management across the spectrum of chronic diseases encountered in primary care.

**RESEARCH QUESTION OR HYPOTHESIS:** Does the integration of CPS in Primary care increase access to rural veterans?

**STUDY DESIGN:** This was a prospective, multi-center, quality improvement project.

**METHODS:** 108 CPS were hired between October 2016 to October 2017 through a $120M 5-year grant to improve access to rural veterans. CPS were evaluated on encounters monthly, number of Veterans served, and the type of interventions provided. Encounters and Veterans served were collected via a national database. CPS interventions were tracked utilizing a standardized template within VA's EHR called the Pharmacists Achieve Results with Medications Documentation (Pharm.D.) tool . This allowed the CPS to efficiently document select interventions made during patient care encounters.

**RESULTS:** Through June 1 2018, the Primary Care CPS served a total of 60,053 veterans, 67.5% of which were rural. These accounted for 159,560 encounters where 269,395 interventions were documented using the Pharm.D. tool. The top four disease states managed by these CPS are diabetes, anticoagulation, hypertension, and lipids. Most of the encounters were completed virtually including via telephone (49%) and clinical video telehealth (6%) with face to face visits comprising 29% of the total. Using an estimated cost savings rate for conversion of physician visits to a CPS visit of $15,130/100 visits, this initiative has resulted in a $2,414,142 cost savings.

**CONCLUSION:** The hiring of Primary Care CPS resulted underserved rural Veterans receiving care for chronic disease states at an overall and an overall cost savings compared to a physician visit.

**23E. Optimizing the approach of mobile application use to improve medication adherence and blood pressure in patients with hypertension** *Maria Thurston, Pharm.D., BCPS*[1], Ayman Akil, Ph.D.[2], Kendra Manigault, Pharm.D., BCPS, BCACP, CDE[3], Sweta M. Patel, Pharm.D., BCPS[4], Lydia Newsom, Pharm.D., BCPS[5], Kevin Murnane, Ph.D.[2]; [1]Department of Pharmacy Practice, Mercer Univeristy College of Pharmacy, Atlanta, GA [2]Mercer Univeristy College of Pharmacy, Atlanta, GA [3]Pharmacy Practice, Mercer University College of Pharmacy, Atlanta, GA [4]Department of Pharmacy, Grady Health System, Atlanta, GA [5]Department of Pharmaceutical Sciences, Emory University Hospital, Atlanta, GA

Presented at the Georgia Bio Innovation Summit, Atlanta, Georgia, October 24, 2017.

**24. Assessment of vitamin b12 monitoring in veterans with type 2 diabetes on metformin therapy** Ashley Higbea, Pharm.D., BCPS[1], *Haley Runeberg, Pharm.D.*[2], Rick Weideman, Pharm.D.[3], Carlos Alvarez, Pharm.D., M.Sc., BCPS[4]; [1]Pharmacy Practice, Texas Tech University Health Science Center School of Pharmacy, Dallas, TX [2]Pharmacy, TTUHSC/VANTXHCS, Dallas, TX [3]pharmacy, VANTXHCS, Dallas, TX [4]School of Pharmacy, Texas Tech University Health Sciences Center, Dallas, TX

**INTRODUCTION:** Metformin use has been linked to vitamin $B_{12}$ deficiency; however, monitoring $B_{12}$ levels has not been common practice. Since 2017, the American Diabetes Association (ADA) *Standards of Medical Care in Diabetes* Guideline included a new recommendation for periodic $B_{12}$ measurements in metformin treated patients. The compliance with this recommendation has yet to be determined.

**RESEARCH QUESTION OR HYPOTHESIS:** Did the ADA guideline's new recommendation impact $B_{12}$ monitoring in a veteran population on long-term metformin therapy?

**STUDY DESIGN:** Retrospective cohort study

**METHODS:** Electronic medical records of veteran patients on metformin who started therapy in 2014 at the VA North Texas Health Care System (VANTHCS) were reviewed. Vitamin $B_{12}$ monitoring records were compared for 2016 versus 2017 for each patient. Patients non-adherent to metformin, without regular follow-up, and those with conditions or medications that could affect $B_{12}$ absorption were excluded. McNemar's test was used for the primary outcome of $B_{12}$ monitoring in 2016 versus 2017.

**RESULTS:** Of 88 patients who met inclusion criteria, 17 (19.3%) had at least one vitamin $B_{12}$ level in 2016 versus 25 (28.4%) patients in 2017 (p=0.1167). The average number of vitamin $B_{12}$ levels per patient was 1.07, and 45 (51.1%) had no documented vitamin $B_{12}$ levels since starting metformin. Seventeen patients were newly diagnosed with neuropathy or prescribed a medication for neuropathy without a vitamin $B_{12}$ level in the previous year, or a low $B_{12}$ level that was not supplemented with cyanocobalamin.

**CONCLUSION:** Vitamin $B_{12}$ monitoring increased after the release of the 2017 ADA *Standards of Medical Care in Diabetes* Guideline. However, the majority of patients did not have a $B_{12}$ level. Symptoms of $B_{12}$ deficiency and diabetic neuropathy are similar, but treatment is different. Patients are being prescribed medication for diabetic neuropathy without checking a $B_{12}$ level. More studies with larger sample size are needed.

**25. Comprehensive medication management: assessing fidelity of implementation across primary care clinics at an academic medical center** *Kyle Turner, Pharm.D.*[1], Melissa Green, Pharm.D.[2], Eve Van Wagoner, Pharm.D.[3], Jerilyn Mckeon, Pharm.D.[2], Golden Berrett, Pharm.D.[4]; [1]Department of Pharmacotherapy, University of Utah College of Pharmacy, Salt Lake City, UT [2]University of Utah, Salt Lake City, UT [3]University of Utah Health, Salt Lake City, UT [4]Pharmacy Primary Care Services, University of Utah Health, Salt Lake City, UT

**INTRODUCTION:** Comprehensive medication management (CMM) is the standard of care that ensures each patient's medications are indicated, effective, safe and able to be taken by the patient as intended. University of Utah Health Pharmacy Primary Care Services (PPCS) pharmacists are implementing CMM in all primary care clinics where they provide clinical services. To ensure similar outcomes to published literature, fidelity to the CMM model must be established. A PPCS

work group is overseeing CMM implementation and determining methods to assess implementation fidelity.

**RESEARCH QUESTION OR HYPOTHESIS:** To what degree of fidelity have clinical pharmacists practicing in primary care implemented comprehensive medication management into practice?

**STUDY DESIGN:** Mixed quantitative-qualitative analysis of process measures (medication therapy problems [MTPs] identified) and survey responses.

**METHODS:** Two assessments were conducted to investigate fidelity; analysis of documented MTPs and a survey instrument to self-report understanding and implementation of CMM key elements. MTPs were categorized and documented according to Pharmacy Quality Alliance (PQA) MTP Categories Framework from September 2017 to March 2018. The survey instrument collected demographics, frequency reporting of clinical activities and a 5-point Likert scale regarding use of the CMM patient care process.

**RESULTS:** 4631 MTPs identified and categorized: indication (29.7%), effectiveness (33.8%), safety (24.2%), and adherence (12.1%). 18 of 21 PPCS pharmacists completed the survey. Demographic results include time in practice (average 5.7 years), completion of PGY1/PGY2 residency (78/56%) and current board certification (79%). Qualitative assessment of CMM definitions demonstrated pharmacists understand the comprehensive nature of the care process. Pharmacists reported "always" or "often" performing each step in the patient care process as follows: indication (93%), effectiveness (93%), safety (87%), adherence (93%) but less in completing those steps in the precise order (60%).

**CONCLUSION:** Implementation of CMM yielded identification of MTPs and foundational fidelity to core principles. Further refinement of implementation is needed to increase understanding and utilization of the care process.

**26. Pharmacist collaboration to increase antimicrobial stewardship in the treatment of urinary tract infections in the primary care setting**

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**INTRODUCTION:** In order to preserve the utility of available antibiotics, antimicrobial stewardship has become an area of increased importance and focus. In published literature, there is a lack of studies involving antimicrobial stewardship efforts by pharmacists directed at urine cultures in the primary care setting.

**RESEARCH QUESTION OR HYPOTHESIS:** The primary objective of this study was to determine the effect of pharmacist interventions on the number of inappropriate days of antibiotics avoided for patients seen by primary care providers for urinary tract infections.

**STUDY DESIGN:** Pharmacy resident quality improvement project that was a post-intervention cohort comparison with a pre-intervention cohort.

**METHODS:** During the post-intervention period, pharmacists reviewed urine culture results, made recommendations to providers about therapy, and followed up with patients regarding the therapy plan. The primary outcome during the intervention period was compared to the pre-intervention period at the same clinics in a 2-month period immediately prior. Secondary objectives included the rate of interventions, rates of different empiric antibiotics prescribed, average antibiotic duration, and pharmacist time spent.

**RESULTS:** During the intervention period, 51 inappropriate days of antibiotics were avoided per 100 cultures, compared to 30 inappropriate days of antibiotics avoided per 100 cultures during the pre-intervention period. Rates of interventions were 19% during the intervention period and 14% during the pre-intervention period. Of pharmacist interventions, 26% resulted in a decrease in antibiotic duration. In the pre-intervention period, providers never decreased duration when modifying therapy. The most common empiric antibiotic prescribed during both time periods was nitrofurantoin, followed by sulfamethoxazole/trimethoprim. The average duration of empiric therapy was 7 days during both time periods. The average time spent by pharmacists performing chart review and making interventions was 18.6 minutes.

**CONCLUSION:** Pharmacists increased the number of inappropriate days of antibiotics avoided, and can play a role in antimicrobial stewardship in the primary care setting.

**27E. Perceptions of integration of the clinical pharmacist into the PCMH model by the PCMH team**

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**28. Impact of a pharmacist to pharmacist transitions of care initiative**

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**INTRODUCTION:** Transitions of care remain one of the most vulnerable times in a patient's encounter within the healthcare system. Multiple research initiatives have highlighted the value of including a pharmacist in the discharge process to prevent medication errors and readmissions. Furthermore, studies have also shown the benefit of utilizing a pharmacist on the outpatient side to aid in these transitions

and prevent readmissions. However, no study to date has evaluated the benefit and impact on readmission rates by implementing an initiative that leverages pharmacist presence in both settings.

**RESEARCH QUESTION OR HYPOTHESIS:** The purpose of this initiative was to assess the impact on readmissions for ambulatory care sensitive conditions when patients are provided standardized counseling prior to discharge and are then scheduled to follow up with a clinical pharmacist within 7-10 days of discharge.

**STUDY DESIGN:** This was a single-center, quasi-experimental, prospective quality improvement initiative.

**METHODS:** Patients who were admitted with a primary or secondary diagnosis of COPD, diabetes, hypertension, or symptomatic heart failure were enrolled. Patients received standardized counseling at discharge and were scheduled to follow up with a clinical pharmacy specialist within 7-10 days of discharge. The primary objective of this study was to determine the impact of a pharmacist-to-pharmacist transitions of care model on composite 30-day readmission rates. Manual chart review was conducted to quantify primary and secondary endpoints.

**RESULTS:** From October 2016 to June 2018, 212 patients were enrolled. All cause 30-day readmission rates decreased from 18.9% to 16.5% for heart failure,13.1% to 6.5% for COPD, 15% to 9% for diabetes, and rates increased from 18.4% to 25% for hypertension. Index readmission rates were 3.2% for heart failure, 6.5% for COPD, and there were no index readmissions for hypertension or diabetes.

**CONCLUSION:** Coordination through a pharmacist-to-pharmacist transitions of care initiative positively impacts 30-day composite readmission rates.

**29. Utilization of high-intensity statins in ambulatory patients at risk for atherosclerotic cardiovascular disease events: a national cross-sectional study** *John Moorman, Pharm.D., BCPS*[1], Jaclyn Boyle, MS, Pharm.D., BCPS[1], Leah Bruno, Pharm.D. Candidate[2], Sara Dugan, Pharm.D., BCPP, BCPS[1], Lukas Everly, Pharm.D., BCPS[1], Kyle Gustafson, Pharm.D., BCPS, BCCCP[1], Nathan Homan, Pharm.D. Candidate[2], Dankesh Joshi, Pharm.D. Candidate[2], Cynthia King, Pharm.D., BCACP, CACP[1], Kevin King, Pharm.D. Candidate[2], Philip King, Pharm.D., BCPS[1], Anthony Pesce, Pharm.D. Candidate[2], Prabodh Sadana, Ph. D.[1], Harold Schneider III, Pharm.D. Candidate, BS[2], Jennifer Toth, Pharm.D., BS, B.A.[2], Amy Unruh, Pharm.D. Candidate[2], Autumn Walkerly, Pharm.D. Candidate[2]; [1]Department of Pharmacy Practice, Northeast Ohio Medical University, Rootstown, OH [2]College of Pharmacy, Northeast Ohio Medical University, Rootstown, OH

**INTRODUCTION:** In 2013, the American College of Cardiology and the American Heart Association published guidelines for managing cholesterol in patients at risk for atherosclerotic cardiovascular disease (ASCVD) events. These guidelines were a departure from the target-based approach to managing cholesterol, and instead identified groups of patients who would benefit most from high-intensity statin therapy.

**RESEARCH QUESTION OR HYPOTHESIS:** What impact did the 2013 cholesterol guidelines have on national prescribing rates of high-intensity statins in patients who met criteria, and what were predictors of prescribing one of these agents?

**STUDY DESIGN:** This was a national cross-sectional study which was conducted using data from the National Ambulatory Medical Care Survey from 2011-2015.

**METHODS:** Office visits involving patients aged 21-75 years who met criteria for high-intensity statin therapy were included. Visits involving pregnant patients were excluded. The primary objective was to compare the prescribing rates of high-intensity statins before and after the 2013 cholesterol guidelines. Multivariate logistic regression identified variables associated with prescribing high-intensity statins.

**RESULTS:** A total of 51,617 patient visits were included, representing 950,503,475 office visits nationally. High-intensity statins were continued or initiated in 9.5% of visits in the pre-guideline cohort versus 16.5% of visits in the post-guideline cohort (odds ratio [OR] 1.89; 95% confidence interval [CI] 1.62-2.20). The strongest independent predictors of prescribing high-intensity statins were concomitant antihypertensive therapy (OR 5.81; 95% CI 4.98-6.76), history of hyperlipidemia (OR 2.90; 95% CI 2.54-3.32), history of clinical ASCVD (OR 1.65; 95% CI 1.42-1.93), Black race (OR 0.66; 95% CI 0.52-0.85), and Hispanic ethnicity (OR 0.66; 95% CI 0.52-0.83).

**CONCLUSION:** Prescribing rates for high-intensity statins increased after the release of the 2013 cholesterol guidelines. However, these prescribing rates are much lower than expected, especially in Black and Hispanic patients. These observations signify opportunities to improve the quality of care for patients who are at risk for major ASCVD events in the United States.

**30. Clinical pharmacy management of glucocorticoid-induced hyperglycemia in patients with diabetes and newly diagnosed cancer undergoing treatment: development and implementation of a workflow for transitioning between ambulatory and oncology pharmacy** *KyAnn Wisse, Pharm.D., BCACP*[1], Dawn Fuke, Pharm.D.[2], Samuel Jacobson, Pharm.D.[3], Yelena Rozenfeld, MPH[4]; [1]Swedish Medical Group, Seattle, WA [2]Clinical Pharmacy Department, Providence Medical Group, Portland, OR [3]Clinical Pharmacy, Providence Medical Group, Portland, OR [4]Providence Medical Group, Portland, OR

**INTRODUCTION:** Glucocorticoids (GC) are incorporated in many chemotherapy regimens with hyperglycemia being the primary side effect. Hyperglycemia has been independently associated with negative outcomes for patients undergoing chemotherapy. The general medical care for patients with diabetes and cancer often falls to the primary care provider (PCP), however studies defining the transition of patients from oncology to primary care are lacking

**RESEARCH QUESTION OR HYPOTHESIS:** Would the incorporation of a primary care clinical pharmacy specialist (CPS) intervention improve blood glucose management in patients with diabetes who are undergoing chemotherapy with GCs?

**STUDY DESIGN:** A feasibility study was conducted to determine the practicality and impact of a clinical pharmacy specialist (CPS)-run intervention to improve the management of blood glucose levels for these patients.

**METHODS:** Patients were identified using an automated report and collaborative practice agreement referral requests were sent to the PCP. After referral approval, patients were followed by CPS until individualized glycemic goals were met, and were compared to a control group of patients who started chemotherapy the year prior. Outcomes assessed included changes to diabetes medications and diabetes-related healthcare utilization.

**RESULTS:** Fifteen patients were enrolled in the intervention group compared to 23 in the control group. Baseline characteristics were similar except that intervention patients were more likely to be male and less likely to have dexamethasone 20 mg or more per week prescribed. Non-routine telephone calls to the oncologist or PCP were decreased with CPS services. Most patients were discharged due to meeting glycemic targets. The weekly dose of GC did not appear to affect variations in glycemic control.

**CONCLUSION:** An effective workflow to transition patients with diabetes between oncology and primary care teams was implemented. While there was an increase in call volume for the CPS, the service led to decreased calls to oncology and primary care providers.

**31. Clinical inertia amongst healthcare providers in diabetes management** *Sara Lingow*, *Pharm.D.*, Justinne Guyton, Pharm.D., BCACP; Department of Pharmacy Practice, St. Louis College of Pharmacy, Saint Louis, MO

**INTRODUCTION:** Clinical inertia is the lack of treatment intensification in patients who are not at evidence-based therapeutic goals. It is a major factor leading to suboptimal patient care in over 25% of patients with diabetes. One study demonstrated less clinical inertia when specialists managed diabetes vs. primary care providers. Limited literature is available evaluating clinical inertia between pharmacists and other healthcare providers in diabetes management.

**RESEARCH QUESTION OR HYPOTHESIS:** In patients with uncontrolled type 2 diabetes, do pharmacists reduce the rate of clinical inertia compared to primary care providers?

**STUDY DESIGN:** Cross-sectional, retrospective cohort study.

**METHODS:** Adults with type 2 diabetes and an A1c >8% were identified during a one-year period. Diabetes care was managed by a pharmacist or primary care provider. The primary outcome compares the rate of treatment intensification between groups at four months, measured by addition of a medicine or a dose increase. Secondary outcomes include the change in subsequent A1c, number of contacts, and a subgroup analysis based on baseline A1c and comorbidities.

**RESULTS:** Seventy-two patients in the pharmacist group and 204 in the primary care provider group were eligible for final analysis. Baseline A1c was similar between groups, while a higher percentage of patients in the pharmacist group were obese with comorbidities. Comparing the pharmacist group to the primary care provider group, overall 79% versus 49% of patients received treatment intensification ($p<0.001$) respectively; noninsulin therapy was intensified 40% versus 32% ($p=0.19$) while insulin therapy was intensified 54% vs 19% ($p<0.001$) respectively. Pharmacists had four patient contacts while primary care providers had one patient contact. There was no between-group difference in A1c lowering.

**CONCLUSION:** Treatment intensification in patients with uncontrolled diabetes was more common in the pharmacist group, thus reducing the rate of clinical inertia compared to primary care providers. This demonstrates the advantage of pharmacist involvement in diabetes care, particularly regarding intensification of insulin therapy.

**32. Evaluation of an ambulatory transitions of care pharmacist service for high risk patients** *Kellie Kippes, Pharm.D., BCPS*[1], Antoinette Coe, Pharm.D., Ph.D.[2], Sarah Aldrich, Pharm.D.[1], Tami Remington, Pharm.D., BCPS[1], Hae Mi Choe, Pharm.D.[2]; [1]Michigan Medicine, Ann Arbor, MI [2]Department of Clinical Pharmacy, University of Michigan College of Pharmacy, Ann Arbor, MI

**INTRODUCTION:** An ambulatory multidisciplinary transition of care program, including a nurse navigator phone call, pharmacist comprehensive medication review (CMR) via telephone, and post-discharge primary care provider (PCP) follow-up visit was implemented for high-risk patients after hospital discharge.

**RESEARCH QUESTION OR HYPOTHESIS:** Are 30-day hospital readmission rates lower in patients who receive a pharmacist CMR? What are the identified medication-related problems (MRPs), recommendations to resolve MRPs, and primary care provider (PCP) acceptance rate?

**STUDY DESIGN:** Retrospective cohort study at an academic medical center.

**METHODS:** An electronic medical record review from September 2017-February 2018 was conducted. Inclusion criteria: LACE score ≥10 upon discharge, established Michigan Medicine PCP, discharged from specific inpatient services, and discharged to home. Primary outcome: 30-day readmissions rates, comparing CMR recipients to eligible patients not scheduled. Secondary outcomes: Pharmacist identified MRPs, recommendations, and PCP acceptance rate. Descriptive statistics, chi-square analysis and multivariable logistic regression were used.

**RESULTS:** A total of 652 discharges were eligible, 406 received a CMR (62%). Average age was 60 years (SD 14.3), 54% were women, 78% were White/Caucasian, and 22% were readmitted within 30 days. CMR recipients had lower 30-day readmission rates compared to those who did not [69 (10.5%) vs. 73 (11.2%), $p=0.003$]. CMR recipients had 0.50 lower odds compared to those without (95% Confidence Interval (CI):0.34-0.73) and those with a LACE score ≥13 had 1.8 times higher odds compared to scores of 10-12 (95% CI: 1.25-2.70) of 30-day readmissions (adjusted for age and race). An average of 4.3 MRPs (SD 2.5) were identified per visit (range 1-11). The top MRPs identified were drug interactions (40%), need for assessment and monitoring (25%), and laboratory tests needed (6%). The most common recommendations were drug interaction review (38%), request for provider review (29%), and patient education (7%). PCPs accepted 55% of pharmacist recommendations.

**CONCLUSION:** Pharmacist-provided CMRs can reduce 30-day hospital readmissions in high-risk patients.

**33. A provider survey to assess the expansion of clinical pharmacy services as part of the comprehensive primary care initiative** Lisa Beckett, Pharm.D., *Abby Frye, Pharm.D.*, Yelena Rozenfeld, MPH; Providence Medical Group, Portland, OR

**INTRODUCTION:** In 2012, the Centers for Medicare and Medicaid Services launched the Comprehensive Primary Care (CPC) initiative to promote innovation in primary care. The initiative required practices to implement advanced care strategies, including comprehensive medication management, integrated behavioral health, and patient self-management support. Thirteen primary care clinics in the Providence Medical Group-Oregon (PMG-OR) region were selected as CPC practice sites and offered the opportunity to expand their clinical pharmacy services. In order to assess the perceived impact of this expansion, a provider survey was conducted.

**RESEARCH QUESTION OR HYPOTHESIS:** Are PMG-OR primary care providers satisfied with the expansion of clinical pharmacy services associated with the CPC initiative?

**STUDY DESIGN:** The Providence Health and Services Institutional Review Board granted expedited study approval. A mixed qualitative-quantitative survey was created and distributed to assess provider satisfaction.

**METHODS:** The survey included statements on the value of clinical pharmacy rated on a 5-point scale and open-ended questions about current and potential future clinical pharmacy services. Providers in PMG-OR CPC clinics were eligible to be surveyed. Clinic leadership was notified of the survey and encouraged survey completion, while clinic pharmacists were excluded from the distribution and collection process.

**RESULTS:** Surveyed providers strongly agreed that clinical pharmacists improve the quality, safety, value, and efficiency of patient care. When asked about specific clinical pharmacy services, the majority of respondents ranked them as very important, with collaborative disease management, high risk medication use in the elderly, and drug information consults as the most highly ranked services. Providers at clinics with higher pharmacist-to-patient panel ratios were more likely to want additional pharmacist time in clinic.

**CONCLUSION:** The survey results were positive indicating a high degree of provider satisfaction with the expansion clinical pharmacy services associated with the CPC initiative. These results should be used to inform the further expansion of clinical pharmacy services in primary care.

**34E. Developing and validating a measure to assess progress and success with implementation of a pharmacy service to optimize medication use** *Melanie Livet, Ph.D.*[1], Carrie Blanchard, Pharm.D., MPH[2], Mary Yannayon, MA[1], Mary Roth McClurg, Pharm.D., MHS[1], Todd D. Sorensen, Pharm.D.[3]; [1]UNC Eshelman School of Pharmacy, Chapel Hill, NC [2]Center for Medication Optimization, UNC Eshelman School of Pharmacy, Chapel Hill, NC [3]Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN

Presented at PQA Annual Meeting, Baltimore, MD, May 2018.

**35. Assessment of chronic disease management among patients with diabetes and coronary artery disease receiving care in a cardiology clinic** *Scott Pearson, Pharm.D.*[1], Courtney Shakowski, Pharm.D.[2], Joseph Vande Griend, Pharm.D.[3], Robert Page II, Pharm.D., MSPH[1], Amber Khanna, MD[4], Garth Wright, MPH[1], Joseph Saseen, Pharm.D.[1]; [1]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO [2]University of Colorado Hospital, Aurora, CO [3]Population Health Services Organization, University of Colorado Health, Aurora, CO [4]Department of Cardiology, University of Colorado Anschutz Medical Center, Aurora, CO

**INTRODUCTION:** Patients with coronary artery disease (CAD) often have multiple comorbidities, including diabetes, hypertension and dyslipidemia. It is unclear if these comorbidities are adequately managed among patients established in a cardiology clinic. Clinical pharmacist interventions could have a positive impact on these potential gaps though integration of disease-state management services.

**RESEARCH QUESTION OR HYPOTHESIS:** How well are chronic disease quality measures achieved among cardiology clinic patients with diabetes and CAD?

**STUDY DESIGN:** Observational retrospective

**METHODS:** University of Colorado Health Cardiac and Vascular Center (CVC) patients age 40-75, with CAD, diabetes and at least 2 CVC visits within a 24-month period were included (n=295). The primary outcome was achievement of five chronic disease quality measures (hemoglobin A1c ≤9.0%, blood pressure <140/90 mmHg, antiplatelet agent, moderate/high-intensity statin, and annual influenza vaccine). Secondary outcomes included additional measures of care quality and covariates predicting higher quality measure achievement. Quality measures were assessed using descriptive statistics. Predictors of quality measure achievement were investigated by multi-variable logistic regression using SAS.

**RESULTS:** Quality measure achievement is shown below:

| Measure | Achievement (% of patients) |
|---|---|
| Antiplatelet | 91% |
| Moderate/high-intensity statin | 89% |
| A1c ≤9% | 81% |
| Blood pressure <140/90 mmHg | 75% |
| Influenza vaccination | 69% |

Women were less likely than men to achieve at least four of the five measures (adjusted odds ratio [OR], 0.44; 95% confidence interval [CI], 0.24-0.80). Patients with two or more primary care provider (PCP) visits within the past year were more likely to achieve at least four measures compared to patients with less

than two PCP visits (adjusted OR, 2.22; 95% CI, 1.14-4.31). When applying more optimal measures, 41% of patients achieved an A1c ≤7%, 52% of patients achieved a blood pressure <130/80 mmHg and 66% of patients were prescribed high-intensity statins.

**CONCLUSION:** Achievement for chronic care quality measures was high, but performance could be further improved, especially among women and patients with infrequent PCP visits.

**36. Pharmacist-physician collaborative care model vs. standard care: assessing time in therapeutic range in patients with hypertension** *Dave Dixon, Pharm.D.*[1], Eric Parod, Pharm.D.[2], Evan Sisson, Pharm.D., MSHA[1], Benjamin Van Tassell, Pharm.D.[3], Pramit Nadpara, Ph.D.[3], Alan Dow, MD, MSHA[4]; [1]Center for Pharmacy Practice Innovation, Virginia Commonwealth University School of Pharmacy, Richmond, VA [2]Sacred Heart Health System, Miramar Beach, FL [3]School of Pharmacy, Virginia Commonwealth University, Richmond, VA [4]School of Medicine, VCU Health System, Richmond, VA

**INTRODUCTION:** Increased time in therapeutic range (TTR), defined as consistent control of systolic blood pressure (SBP) of 120-140 mmHg, is reflective of low SBP variability and is associated with reduced all-cause mortality in patients with hypertension. Pharmacist-physician collaborative care models (PPCCM) improve BP control rates and reduce mean BP, but it is unknown if PPCCM affect time in therapeutic range.

**RESEARCH QUESTION OR HYPOTHESIS:** Does a PPCCM increase TTR for SBP compared to standard care?

**STUDY DESIGN:** Subgroup analysis of a retrospective cohort study

**METHODS:** Medical records were reviewed from a safety-net free clinic using a PPCCM and primary care practices linked to an indigent care program managed by an academic medical center (standard care). New patients presenting with uncontrolled hypertension were included. Exclusion criteria consists of eGFR <30ml/min, <2 BP readings, and pregnancy. Patients were matched between groups according to gender, baseline SBP, and history of cardiovascular disease. TTR was determined as the proportion of clinic visits with SBP between 120-140 mmHg during the 12-month follow-up period. Means were compared using a t-test, while counts and comparisons were compared using a chi-squire or Fisher exact test.

**RESULTS:** 112 matched patients (56 per group) were identified for inclusion. Baseline characteristics were similar between groups except the standard care group was slightly older than the PPCCM group (50.4 vs. 46.5 years, p=0.03). The TTR for the PPCCM group was significantly higher than the standard care group (46.2% ±24.3 vs. 24.8% ±27.4, p<0.001). The total proportion of patients in the more consistently controlled quartiles (TTR 51-75% and 75-100%) was 43.1% in the PPCCM group compared to only 10.6% in the standard care group.

**CONCLUSION:** These findings suggest a PPCCM achieves higher TTR for SBP than standard care. Studies are warranted to prospectively evaluate the benefit of these models on cardiovascular outcomes.

**37E. Pharmacotherapeutic approaches to management of type 2 diabetes: a retrospective study of clinical pharmacist management versus usual care in a federally qualified health center** *Emanuela Mooney, Pharm.D.*[1], Rhianna Fink, Pharm.D.[2], Sarah Billups, Pharm.D.[2], Joseph Saseen, Pharm.D.[2]; [1]Skaggs School of Pharmacy and Pharmaceutical Sciences, University of Colorado, Aurora, CO [2]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

Presented at the Mountain States Conference, Salt Lake City, UT, May 10-11, 2018.

**38. Primary care providers' perspectives, perceived barriers, and preferred facilitators regarding hepatitis c virus screening in the primary care setting** Khushbu Tejani, Pharm.D.[1], Sara Baghikar, MD, MPH[2], Deval Gor, B.Pharm, M.Pharm[3], Edith A. Nutescu, Pharm.D., MS[4], *Michelle T. Martin, Pharm.D.*[5]; [1]Pharmacy Practice, University of Illinois at Chicago, Chicago, IL [2]University of Illinois at Chicago School of Public Health, Chicago, IL [3]Pharmacy Systems, Outcomes and Policy, University of Illinois at Chicago College of Pharmacy, Chicago, IL [4]Pharmacy Systems, Outcomes and Policy; Center for Pharmacoepidemiology and Pharmacoeconomic Research, University of Illinois at Chicago College of Pharmacy, Chicago, IL [5]Pharmacy Practice, University of Illinois at Chicago College of Pharmacy/University of Illinois Hospital and Health Sciences System, Chicago, IL

**INTRODUCTION:** About 50 percent of patients in the United States are unaware of their hepatitis C virus (HCV) infection. Guidelines recommend HCV screening in patients born between 1945 and 1965; they have a six-fold increased risk of HCV infection compared to the general population. Primary care providers (PCPs) at the authors' institution have low HCV screening rates among patients born between 1945 and 1965.

**RESEARCH QUESTION OR HYPOTHESIS:** What are PCPs' perspectives toward HCV screening, perceived barriers, and preferred facilitators for the implementation of a HCV screening process in the primary care setting?

**STUDY DESIGN:** A single-center cross-sectional survey was conducted.

**METHODS:** Investigators developed a 25-item survey to assess demographics, confidence, comfort with, and attitude toward HCV screening, test interpretation, and treatment. Knowledge, perceived barriers, and facilitators were also assessed. Survey items were reviewed by authors and physicians at the institution for face validity and updates were made based on feedback. Email addresses of PCPs were obtained from administrators. Survey links were emailed to PCPs at three primary care locations within the academic medical center.

**RESULTS:** The survey response rate was 30% (71/240). Providers reported that 35% of their patients were born between 1945 and 1965, and 97% agreed that the primary care setting is an appropriate place to conduct HCV screening. Ninety-five percent of respondents felt comfortable referring patients to the hepatology clinic for HCV care, and only 4% felt confident in initiating HCV treatment. Lack of time was the most common barrier reported, and an electronic health

record (EHR) prompt was the most common facilitator requested to aid in HCV screening.

**CONCLUSION:** Opportunities exist for improving HCV screening rates in the medical center. PCPs identified barriers of time, knowledge, and training, yet perceived primary care as an appropriate venue for HCV screening. Further directions include implementation of training programs and an EHR prompt to increase HCV screening rates.

**39. Prediabetes and pharmacist opinion: an opportunity for team-based care** *Nicholas Carris, Pharm.D.*, Kevin Cowart, Pharm.D., MPH and Angela Garcia, Pharm.D., MPH; Department of Pharmacotherapeutics & Clinical Research, University of South Florida College of Pharmacy, Tampa, FL

**INTRODUCTION:** An estimated 84 million patients in the United States have prediabetes. Evidence-based interventions to prevent diabetes are insufficiently used. Expanding diabetes prevention interventions through pharmacist involvement in team-based care is supported by guidelines and federal agencies. However, strong contention regarding prediabetes and diabetes prevention exists among clinicians. Therefore, pharmacist opinion must be explored prior to implementation of diabetes prevention through physician-pharmacist team-based practice models.

**RESEARCH QUESTION OR HYPOTHESIS:** Do pharmacists support the American Diabetes Association (ADA) recommendations related to diabetes prevention?

**STUDY DESIGN:** An anonymous survey was electronically distributed through the American College of Clinical Pharmacy Ambulatory Care Practice and Research Network.

**METHODS:** The primary outcome was the proportion of respondents who reported supporting all three of the ADA diabetes prevention related recommendations (i.e., prediabetes screening, lifestyle intervention, and metformin). The University of South Florida Institutional Review Board determined the study to be exempt. Data collection and analysis occurred in 2017.

**RESULTS:** A total of 133 surveys were returned from 34 states. In general, the ADA guideline was the most commonly supported guideline related to diabetes prevention (90%). Of the respondents, 87% supported all three of the ADA recommendations regarding diabetes prevention. Lifestyle intervention was supported by all respondents (100%), followed by screening for prediabetes (96%), and metformin for diabetes prevention (90%). Nearly all respondents felt that attempting to prevent type 2 diabetes was important (99%), although only 76% of respondents agreed that their current practice structure was conducive to implementing evidence-based diabetes prevention methods.

**CONCLUSION:** Outpatient clinical pharmacists appear to support the ADA recommendations regarding prediabetes. Therefore, pharmacists may be key partners for implementing diabetes prevention interventions and/or partnering with the Centers for Disease Control and Prevention's recent initiative, "Rx for the National Diabetes Prevention Program". Future research should explore system-barriers to the implementation of diabetes prevention methods in physician-pharmacist team-based practice models.

**40. Improved adherence to a controlled substance agreement policy: an interprofessional approach** *Insaf Mohammad, Pharm.D., BCACP*[1], Mohamad Elabdallah, MD[2], Ruaa Elteriefi, MD, FACP[2]; [1]Department of Pharmacy Practice, Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University, Detroit, MI [2]Department of Internal Medicine, Beaumont Hospital Dearborn, Dearborn, MI

**INTRODUCTION:** Overuse of controlled substances has created a public health crisis that requires efforts to prevent misuse, abuse, diversion, and death. Although guidelines recommend measures such as controlled substance agreements (CSAs) to attenuate risks, adherence to these practices remains inadequately evaluated. Furthermore, best practices to promote use of and adherence to CSAs are undefined.

**RESEARCH QUESTION OR HYPOTHESIS:** Can an interprofessional team-based approach to quality improvement (QI) impact adherence to a CSA policy in a resident-run internal medicine clinic with a newly embedded clinic pharmacist?

**STUDY DESIGN:** Quasi-experimental pre-post intervention study utilizing two "Plan-Do-Study-Act" (PDSA) cycles.

**METHODS:** The percentage of patients on long-term controlled substances (>3 continuous months or recurrent use >6 months) with a signed CSA in the electronic medical record was compared 6 months prior to and 5 and 15 weeks after implementation of interprofessional interventions to improve policy adherence. In the first cycle, the clinic pharmacist identified patients meeting policy criteria and educated medical residents, providers, and staff to ensure CSAs were discussed and signed during patient visits. In the second cycle, pharmacist education to the team was optimized to also include benzodiazepines and other non-opioid controlled substances. The outcome was percentage of signed CSAs. MedCalc was used for statistical analysis.

**RESULTS:** We included 320 patients (79 pre-QI and 241 post-QI); controlled substance medication did not differ between groups. Prior to QI initiatives, 15% of eligible patients had a signed CSA. Five weeks after implementation of QI, 51% of patients had a signed CSA (OR 5.8, 95% CI 2.8-12, $p<0.0001$ versus pre-intervention). The proportion increased to 82% at 15 weeks (OR 25, 95% CI 12-54, $p<0.0001$ versus pre-intervention).

**CONCLUSION:** This study demonstrated improved adherence to the clinic CSA policy. The odds of a signed CSA were 25 times higher after the second PDSA cycle, demonstrating the benefit of the team-based approach with a clinic pharmacist.

**41. Impact of conversion from long-acting or intermediate-acting basal insulin to follow-on insulin glargine on dosing and clinical outcomes** *Marina Maes, Pharm.D.*[1], Emily Ashjian, Pharm.D., BCPS, BCACP[2], Kellie Kippes, Pharm.D., BCPS[2], Vincent Marshall, MS[3], Nada Rida, BS[4], Amy Thompson, Pharm.D., BCPS[2]; [1]Department of Pharmacy, Michigan Medicine, Ann Arbor, MI [2]Department of Clinical

Pharmacy, University of Michigan College of Pharmacy, Ann Arbor, MI [3]Department of Clinical, Social and Administrative Sciences, University of Michigan College of Pharmacy, Ann Arbor, MI [4]University of Michigan College of Pharmacy, Ann Arbor, MI

**INTRODUCTION:** Several basal insulins have recently come to market including the first follow-on, insulin glargine (Basaglar). Patients are frequently being switched to Basaglar, often due to insurance coverage. There is currently no real-world data published on the implications of conversion to Basaglar on dosing or glycemic control.

**RESEARCH QUESTION OR HYPOTHESIS:** Do patients converted from an intermediate- or long-acting basal insulin require a higher, lower, or equivalent dose of Basaglar? Does hemoglobin A1c (HbA1c) and/or weight change after conversion to Basaglar?

**STUDY DESIGN:** Single-center, retrospective chart review at an academic medical center. All patients prescribed Basaglar between December 15, 2016-August 31, 2017 were included if converted from another basal insulin.

**METHODS:** Primary outcome: Difference in basal insulin requirements in both units/day and units/ kilogram(kg)/day after conversion to Basaglar. Pre-conversion dose was defined as the last dose the patient was taking prior to conversion to Basaglar. Post-conversion dose was defined as the last dose of Basaglar the patient was taking closest to the conclusion of study. Secondary outcomes included change in HbA1c and weight.

**RESULTS:** 93.8% of patients (166/177) were converted from Lantus to Basaglar. Mean basal insulin dose was 38.4±26.3units/day pre-conversion and 40.5±29.8units/day post-conversion (difference 2.0±12.5units/day; p=0.031). Results were significant for patients with T2DM (pre-conversion basal dose 34.7±24.3units/day; post-conversion basal dose 37.7±29.1units/day; difference 3.0±11.9; p=0.009) but not for T1DM. Weight based dosing changed from 0.37±0.25units/kg/day pre-conversion to 0.39±0.29 units/kg/day post-conversion (difference 0.02±0.13; p=0.056) and was found to be significant for patients with T2DM (pre-conversion: 0.33±0.21units/kg/day; post-conversion 0.36±0.27units/kg/day; difference 0.03±0.13; p=0.04). A non-significant decrease in HbA1c was seen overall (-0.14±1.24%; p=0.142), however a statistically significant difference was seen in patients with T2DM (-0.25±1.30%; p=0.048). There was no difference seen in weight (111.6±46.3kg vs 111.7±46.9kg; 0.2±5.7kg; p=0.662).

**CONCLUSION:** Patients with T2DM required a higher dose of basal insulin upon conversion to Basaglar. Clinicians should monitor blood glucose closely during basal insulin transition.

**42. Impact of pharmacist-led education on appropriate prescribing for patients with COPD** *Roger Iain Pritchard, Pharm.D.*[1], Lauren Donohue, Pharm.D.[2], Rebecca A. Falter, Pharm.D.[3]; [1]Department of Pharmacy Practice, Bernard J. Dunn School of Pharmacy, Shenandoah University, Winchester, VA [2]Lancaster, PA [3]Bernard J. Dunn School of Pharmacy, Shenandoah University, Winchester, VA

**INTRODUCTION:** Current GOLD guidelines indicate a clear preference for treatment with long-acting beta-agonists and long-acting muscarinic antagonist (LABA/LAMA), alone or in combination, over combination therapy with inhaled corticosteroids (ICS). It has been reported that COPD prescribing practices do not correlate with Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines, however, there is limited data regarding interventions to improve prescribing.

**RESEARCH QUESTION OR HYPOTHESIS:** Examine the impact of pharmacist-led education on COPD prescribing practices at an outpatient family practice.

**STUDY DESIGN:** A single-center, non-randomized, before and after study.

**METHODS:** Patient charts were reviewed for patients 18 years of age and older, with a COPD diagnosis, and prescribed a LABA/ICS. Patients were excluded if they had a diagnosis of asthma. Patients were categorized into one of four treatment groups based upon the 2017 GOLD guidelines. Prescribing habits were then compared to guideline recommendations. Data was presented to the providers in a 30-minute in-service which showcased the clinic's current COPD prescribing practices, how practices compared to current GOLD guideline recommendations, and strategies for improving concordance with the guidelines. After the in-service the chart was reviewed again to evaluate changes in prescribing.

**RESULTS:** Prior to the intervention, 86% of patients in GOLD groups A or B and 61% in groups C or D were prescribed a LABA/ICS without documented indications for this therapy. Three months post-intervention, our analysis showed an 11% decrease in LABA/ICS prescribing in GOLD groups A or B and a 12% decrease in GOLD groups C or D. Across all GOLD groups, appropriateness of prescribing increased from 21.7% to 55.1% (p<0.001).

**CONCLUSION:** The 2017 GOLD recommendations updated the standard of care for patients with COPD. Data showed a lack of alignment to this standard at our practice, which is noted nationally. Pharmacist-led education delivered to providers significantly improved appropriate prescribing rates for patients with COPD, though long-term monitoring is warranted.

**43. Assessing barriers to prescribing naloxone at a primary care center** *Tamara Malm, Pharm.D., MPH*[1], Jamie Blanck, Pharm.D.[2], Zuri Erani, Pharm.D.[2], Jason Dukes, MD, MBA[1]; [1]Yale New Haven Hospital, New Haven, CT [2]University of Saint Joseph School of Pharmacy, Hartford, CT

**INTRODUCTION:** Opioid overdose deaths are a national epidemic. The CDC recommends patients prescribed ≥ 50 morphine milligram equivalents (MME) per day of chronic opioid therapy have a naloxone prescription. Despite this recommendation, naloxone prescribing at Yale New Haven Hospital (YNHH) Primary Care Centers (PCC) is inconsistent.

**RESEARCH QUESTION OR HYPOTHESIS:** Primary Care Physician (PCP) discomfort discussing and prescribing naloxone leads to low rates of naloxone prescribing amongst patients prescribed ≥ 50 MME/day of opioid therapy at YNHH PCC.

**STUDY DESIGN:** Single-center, retrospective review and survey

**METHODS:** A third party insurance claim database was utilized to generate a report of patients on opioid therapy between March 2017 and March 2018. Inclusion criteria: >18 years old, PCP at the study site, and [3] 1 opioid prescription filled during the specified date range. Exclusion criteria: MME < 50, or patient never seen for primary care at the study site. Electronic medical records were used to collect total MME/day, and presence of a naloxone prescription. PCPs were given paper surveys to capture attitudes regarding naloxone. The primary outcome is the rate of and barriers to naloxone prescribing amongst PCPs at this facility.

**RESULTS:** Eighty-five patients met inclusion and exclusion criteria. Average prescribed MME was 100mg (range 60 – 1,320mg). Valid naloxone prescriptions were present for 8 patients (9.4%). Twenty-five PCPs were surveyed, of which 25 (100%) stated they have prescribed an opioid, while 7 (28%) had prescribed naloxone. Majority (52%) of PCPs were not comfortable talking about naloxone with patients, while 40% were somewhat comfortable and 12% were very comfortable. Two PCPs could identify the appropriate routes of naloxone administration.

**CONCLUSION:** PCP discomfort with prescribing and discussing naloxone is a barrier to increasing rates of qualified patients with a valid naloxone prescription. PCPs are a valuable resource for increasing patient naloxone education, and expanding naloxone access.

**44. Effect of clinical pharmacist encounters in the transitional care clinic on 30-day readmissions** Priscile Kouamo, MD[1], Panid Borhanjoo, MD[2], Mafuzur Rahman, MD[2], Margaret Eckert-Norton, RN, Ph. D.[2], *Madhavi Gavini, Pharm.D.*[3]; [1]SUNY Downstate School of Public Health, Brooklyn, NY [2]Department of Internal Medicine, SUNY-Downstate Medical Center, Brooklyn, NY [3]Department of Pharmacy, Department of Family Medicine, SUNY- Downstate Medical Center, Brooklyn, NY

**INTRODUCTION:** Hospitalized patients who meet specific criteria at discharge are referred to the transitional care clinic where a nurse practitioner and /or physician and a clinical pharmacist work collaboratively to manage patients' medication regimens. The team supports patient adherence and ensures appropriate follow-up care. In collaboration with the provider, the clinical pharmacist reviews medications for appropriateness, assesses adherence, recommends medication changes and provides education.

**RESEARCH QUESTION OR HYPOTHESIS:** What are the effects of clinical pharmacist encounters in a transitional care clinic on 30-day readmission rates as compared to readmission rates of patients not seen by the pharmacist?

**STUDY DESIGN:** This is a single-center retrospective study.

**METHODS:** After receiving IRB approval, a retrospective chart review was conducted on adult patients seen at the transitions of care clinic between January 1st, 2016 to December 31st , 2017.

**RESULTS:** Logistic regression was used to predict 30-day readmission (for any reason) from presence of clinical pharmacist, patient age, gender, number of comorbidities and insurance status. Records for 527 patient visits were analyzed; 390 (74%) patient visits with the nurse practitioner and /or physician and pharmacist, 137 (26%) did not include a pharmacist. Forty-six (8.7%) out of 527 patients had 30-day readmissions, 32(69.6%) of the 46 were seen by the pharmacist and 14 (30.4%) were not (Fisher's exact test p=0.490). Readmission rates for patients seen by the pharmacist was 8.2% (32 /390) and those not seen by the pharmacist was 10.2% (14/137). There was no significant difference in 30-day readmissions based on pharmacist interventions (Mantel-Haenszel test of trend p=0.504). The only significant independent predictor of readmission was number of comorbidities (adjusted odds ratio 1.26, 95% confidence interval 1.07-1.47, p=0.005). Results were similar when readmissions for same reason, or for a different reason, were excluded.

**CONCLUSION:** There was no significant difference on 30-day readmissions in patients seen by the clinical pharmacist in the transitional care clinic.

**45. Impact of team-based efforts to improve medication reconciliation for geriatric patients in a resident-run internal medicine clinic** *Insaf Mohammad, Pharm.D., BCACP*[1], Rabia Bangash, MD[2], Jeffrey Kane, MD[2]; [1]Department of Pharmacy Practice, Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University, Detroit, MI [2]Department of Internal Medicine, Beaumont Hospital Dearborn, Dearborn, MI

**INTRODUCTION:** Geriatric patients have complex medication regimens and are vulnerable to medication-related errors. Inadequate medication reconciliation (MR) accounts for 46% of all medication errors, with ~20% of errors resulting in harm. Innovative and collaborative MR approaches must be explored to identify best practices that attenuate risks.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the impact of team-based MR quality improvement (QI) initiatives on the proportion of geriatric patients with (1) duplicate medications documented on the electronic medical record (EMR) medication list, (2) medications documented without dosage or instructions, and (3) completed acute management medications documented on the EMR medication list?

**STUDY DESIGN:** Quasi-experimental pre-post intervention study utilizing "Plan-Do-Study-Act"

**METHODS:** QI initiatives included EMR reminders and education to staff/providers by the clinic pharmacist to ensure MR is completed during every patient visit. We reviewed the EMR medication lists for patients ≥60years old with ≥5 medications. Outcomes included proportion of patients with ≥1 (a) duplicate medication documented on the medication list with the same or different dosage/instructions; (b) medication without dosage or instructions documented; and (c) completed acute management medication remaining on the list. Descriptive statistics were used.

**RESULTS:** We included 98 patients (pre-QI n=47, mean age 71.6, average 13 medications; post-QI n=51, mean age 66.7, average 12 medications). Post-QI, proportion of patients with ≥1 duplicate medication with the same dosage/instructions documented decreased (23% vs. 14%); patients with ≥1 duplicate medication with different dosage of the same medication decreased (19% vs. 10%); patients

with ≥1 duplicate medication with different instructions of the same medication decreased (11% vs. 4%); patients with ≥1 medication without a dosage documented decreased (4% vs. 0%); patients with ≥1 medication without instructions increased (11% vs. 14%); patients with ≥1 completed acute management medication documented decreased (34% vs. 16%).

**CONCLUSION:** Team-based geriatric MR initiatives led to a reduction in duplicate medications, medications without dosage, and completed acute management medications documented.

**46E. Comparing statin prescribing rates in eligible HIV vs. non-HIV infected patients** Alison Blackman, Pharm.D.[1], *Neha Sheth Pandit, Pharm.D., AAHIVP, BCPS*[2], Kathleen Pincus, Pharm.D., BCPS[2]; [1]Department of Pharmacy Services, University of Maryland Medical Center, Baltimore, MD [2]Department of Pharmacy Practice and Science, University of Maryland School of Pharmacy, Baltimore, MD
Presented at ID Week, San Francisco, CA, October 3-7, 2018.

**47. Reliability and validity of a patient responsiveness survey for comprehensive medication management** *Carrie Blanchard, Pharm.D., MPH*[1], Jimmy Xu, Pharm.D. Candidate[2], Mary Roth McClurg, Pharm. D., MHS[2], Melanie Livet, Ph.D.[2]; [1]Center for Medication Optimization, UNC Eshelman School of Pharmacy, Chapel Hill, NC [2]UNC Eshelman School of Pharmacy, Chapel Hill, NC

**INTRODUCTION:** Measuring patient responsiveness, the extent in which a patient engages in or accepts an intervention, is an important precursor to patient engagement in pharmacy services. This includes three components: 1) the patient-pharmacist relationship, 2) whether the intervention met the patient's needs, and 3) patient satisfaction. While measures of patient satisfaction for pharmacy services exist, no surveys have set out to measure patient responsiveness comprehensively.

**RESEARCH QUESTION OR HYPOTHESIS:** The purpose of this study is to establish reliability and validity for a patient responsiveness survey for comprehensive medication management.

**STUDY DESIGN:** As part of the "CMM in Primary Care" study, a multi-state network of 40 clinical pharmacists was used to pilot the survey.

**METHODS:** A multiphase development process was used including: (1) literature search and item generation, (2) content validity, (3) pilot of the survey, and (4) reliability testing and construct validation.

**RESULTS:** A 30 item questionnaire designed to measure the 3 components of patient responsiveness using a 4-point Likert scale was developed and content validity was established. The survey was piloted (n=400) with a response rate of 31.25%. Reliability testing indicated Cronbach's alpha to be 0.98. An exploratory factor analysis (EFA) was conducted. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis (KMO=0.93); the Bartlett's Test was significant (p<.0001); and the data was appropriate for factor analysis with communalities greater than 0.30. Based on analysis, a single factor explained 20.59% of the variance, with a second and third factor only explaining an additional 1.31% and 0.89%, respectively.

**CONCLUSION:** Results support the reliability of the measure. However, EFA data revealed a single, rather than the expected 3-factor structure. In addition, patient responsiveness accounted for 20.59% of the variance, indicating that approximately 80% of variance is explained by other concepts. Future iterations of the survey should include additional factors believed to impact patient responsiveness, such as social determinants of health.

## CARDIOVASCULAR

**48E. Reduced risk of NSAID induced adverse events with concomitant use of misoprostol** *Mark Munger, Pharm.D.*; Department of Pharmacotherapy and Internal Medicine, University of Utah, Salt Lake City, UT
Published in JACC 2017;69(11):1759 (Abstract).

**49. Low density lipoprotein cholesterol control in patients with ischaemic heart disease** Elisa Curtolo, Final year MPharm student[1], Francesca Wirth, B.Pharm.(Hons), M.Phil., Ph.D.[2], Robert G. Xuereb, MD, FRCP, FASA, FESC, FACC[3], Liberato Camilleri, B.Ed.(Hons), M. Sc., Ph.D.(Lanc.)[4], Andrea Cignarella, MPharm, Ph.D.[5], *Lilian M. Azzopardi, BPharm. (Hons.). MPhil., Ph.D.., MRPharmS, FFIP*[2]; [1]Dipartimento di Scienze del Farmaco, Università degli Studi di Padova, Padova, Italy [2]Department of Pharmacy, University of Malta, Msida, Malta [3]Department of Cardiology, Mater Dei Hospital, Msida, Malta [4]Department of Statistics and Operations Research, University of Malta, Msida, Malta [5]Dipartimento di Medicina, Università degli Studi di Padova, Padova, Italy

**INTRODUCTION:** American guidelines on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular disease risk recommend use of the appropriate intensity of statin and not a specific LDL–C target. European guidelines for the management of dyslipidaemias recommend a target LDL-C goal <1.8 mmol/L or at least 50% relative reduction.

**RESEARCH QUESTION OR HYPOTHESIS:** Are patients with ischaemic heart disease (IHD) reaching target LDL-C goals recommended by European guidelines?

**STUDY DESIGN:** Retrospective cohort study

**METHODS:** Following ethics approval, patients with coronary angiography performed between 1 December 2014 and 31 March 2015, diagnosed with IHD and referred for percutaneous coronary intervention (PCI), coronary artery bypass grafting (CABG) or medical treatment, were consecutively identified from the Cardiology Department at Mater Dei Hospital, a general acute hospital. Patients with previous PCI/CABG were excluded. Baseline (time of angiogram) and follow-up (after 6-12, 13-18, 19-24 months) LDL-C levels and lipid-lowering therapy were recorded. Data was analysed with IBM SPSS Statistics.

**RESULTS:** Data for 198 patients (73% male, mean age 66.82 ±10.07 years, 67% referred for PCI) was compiled. Mean LDL-C in mmol/L

was 2.98 ±1.04 (baseline), 2.11 ±0.71 (6-12 months), 2.15 ±0.72 (13-18 months) and 2.07 ±0.62 (19-24 months). LDL-C level was at target in 12% of the patients at baseline, 37% at 6-12 and 13-18 months and 40% at 19-24 months. At baseline, 88% of the patients were on simvastatin. A change in statin was recorded in 47 patients at 19-24 months; simvastatin to atorvastatin (38 patients). Mean LDL-C reduction from baseline to 19-24 months when statin was changed (1.37) was significantly larger versus when statin was unchanged (0.74) (p=0.001).

**CONCLUSION:** Mean LDL-C was significantly higher than the target at all timepoints and only 40% of patients achieved target LDL-C after 19-24 months. Changing simvastatin to higher intensity statins resulted in a significantly larger mean LDL-C reduction compared to patients kept on simvastatin.

**50. Characterization of thrombocytopenia using a low dose heparin anticoagulation protocol for Impella CP devices in cardiogenic shock** *Andrea Sikora Newsome, Pharm.D., BCPS, BCCCP*[1], Ashley Taylor, Doctor of Pharmacy[2], Seth Garner, Pharm.D. Student[2]; [1]Department of Pharmacy, UGA College of Pharmacy, Augusta, GA [2]UGA College of Pharmacy, Augusta, GA

**INTRODUCTION:** Impella CP is a temporary, percutaneous left ventricular assist device (LVAD) that requires a heparin-dextrose purge solution to decrease risk of device thrombosis. Data regarding purge solutions is limited to case reports and one retrospective review of 12 patients using a different purge solution.

**RESEARCH QUESTION OR HYPOTHESIS:** What are the platelet trends in patients managed with temporary LVAD devices and low dose heparin purge solution?

**STUDY DESIGN:** Single site retrospective review

**METHODS:** A single site retrospective review was conducted for all adults with the Impella CP from 2015 to 2017. Data collection included patient demographic information, duration of percutaneous LVAD support, components and concentrations of purge solution, coagulation laboratory values, systemic anticoagulation, and adverse events. Descriptive statistics were used.

**RESULTS:** A total of 21 patients were included. At 24 hours, 14 of 21 patients (67%) had reduced platelet counts, and at 72 hours, all patients had reduced platelet counts. Of the 12 patients with an LVAD at 72 hours, 10 (83%) had thrombocytopenia (platelet count < 150 thousand/mm$^3$). The median absolute reduction in platelet count was 86 (IQR 69). The median percentage reduction in platelet count was 57.4% (IQR 27.2%). Six patients were tested for heparin-induced thrombocytopenia, with one testing positive (n=1, 4.8%). No device thrombosis was observed.

**CONCLUSION:** All patients had reductions in platelet count that met criteria for 2 points on the 4Ts score; however, only patient was diagnosed with HIT. This evaluation observed a consistent platelet reduction with the use of LVAD for cardiogenic shock but with a rate of HIT similar to other patient populations.

**51. The role of desmopressin as a blood conservation agent in select patients undergoing cardiac surgery** *Emily Moose, Pharm.D.* and Evan Tatum, Pharm.D.; Department of Pharmacy, Novant Health Forsyth Medical Center, Winston-Salem, NC

**INTRODUCTION:** Blood conservation strategies are implemented during cardiac surgery to decrease the potential short-term and long-term complications associated with blood transfusions.

**RESEARCH QUESTION OR HYPOTHESIS:** The objective of this study was to determine if there was a difference in transfusion requirements and Factor VIIa use between patients that receive desmopressin (DDAVP) and those that do not, that undergo cardiac surgery for aortic stenosis.

**STUDY DESIGN:** Single-center, retrospective study approved by the Institutional Review Board.

**METHODS:** Adult patients undergoing cardiac surgery for aortic stenosis between June 1, 2016 and August 31, 2017 were included in the study. Patients were excluded for uremia, the presence of von Willebrand disease or hemophilia A, existing or prior history of hyponatremia, contraindication or hypersensitivity to DDAVP, or if anticoagulation or antiplatelet therapies were not held appropriately prior to surgery. The treatment group received DDAVP 0.3 mcg/kg intravenously post-bypass during protamine administration. The control group did not receive DDAVP and were randomized based on cardiothoracic surgeon. In both arms, rates of acute renal failure, hyponatremia, transfusion requirements, and recombinant factor VIIa use were evaluated postoperatively.

**RESULTS:** A total of 59 patients were included in the final analysis. The primary endpoint showed less transfusion requirements 6 hours after surgery, 5 patients (19%) in the DDAVP group and 12 patients (37%) in the control group (P=0.0896). There was no difference in factor VIIa use, the rates of renal failure, and hyponatremia between the groups.

**CONCLUSION:** The current body of literature regarding the use of desmopressin in cardiac surgery is very limited. DDAVP may have a role in cardiac surgery in patients with aortic stenosis, but additional research is needed for validation.

**52E. Reasons for failure to optimize guideline-directed medical therapy for heart failure with reduced ejection fraction patients in clinical practice** Katelyn Smith, Pharm.D.[1], *Jacqueline Dunning, Pharm.D.*[1], Christina Fischer, MS[2], Liliana Fera, MSN, AGNP-C[1], Taylor Maclean, MS, OTR/L[1], Joshua Bosque-Hamilton, BS[1], Lina Matta, Pharm.D., MPH[1], Thomas Gaziano, MD, M.Sc.[1], Calum MacRae, MD, Ph.D.[1], Benjamin Scirica, MD[1], Akshay Desai, MD, MPH[1]; [1]Cardiovascular Innovation Program at Brigham and Women's Hospital, Boston, MA [2]Cardiovascular Innovation Program at Brigham and Women's Hospital, Bo, MA

Presented at Heart Failure Society of America, Nashville, TN, September 15-18, 2018.

**53. Optimal medical therapy prescribing patterns and disparities identified in patients with acute coronary syndromes** *Ashley N. Fox,*

*Pharm.D.*[1], Grant H. Skrepnek, Ph.D., RPh[2], Jamie L. Miller, Pharm.D., BCPS, BCPPS[3], Nicholas C. Schwier, Pharm.D., BCPS-AQ cardiology[4], Toni Ripley, Pharm.D., FCCP, BCPS (AQ-Card), ASH-CHC[3]; [1]Department of Pharmacy: Clinical and Administrative Sciences, University of Oklahoma HSC College of Pharmacy, Oklahoma City, OK [2]Department of Clinical and Administrative Sciences, College of Pharmacy, University of Oklahoma Health Sciences Center, Oklahoma City, OK [3]Department of Pharmacy: Clinical and Administrative Sciences, University of Oklahoma College of Pharmacy, Oklahoma City, OK [4]University of Oklahoma College of Pharmacy, Oklahoma City, OK

**INTRODUCTION:** Cardiovascular disease is the leading cause of death in the United States. In 2018, Oklahoma ranked 52 within the United States and its territories for coronary heart disease (CHD) age-adjusted death. Pharmacotherapy including: dual antiplatelet therapy (DAPT) with aspirin and P2Y12 receptor antagonists, beta-adrenergic blockers, angiotensin converting enzyme inhibitors (ACE-I) or angiotensin receptor blockers (ARBs), and statin therapy has reduced CHD death. A regimen of 5 agents, or *optimal medical therapy* (OMT) is recommended by guidelines. OMT is prescribed 50-60% of the time, and may vary on patient presentation or demographics. Due to significant mortality of CHD in Oklahoma, research on OMT prescribing is warranted to improve practices and identify disparities.

**RESEARCH QUESTION OR HYPOTHESIS:** OMT prescribing at an academic medical center in Oklahoma is < 50% described in literature.

**STUDY DESIGN:** This is a retrospective, single-center, review at an academic medical center in Oklahoma.

**METHODS:** Patients were identified by ICD9 diagnosis code for acute coronary syndrome (ACS) from 7/2013-7/2015. The primary endpoint was percentage of OMT prescribed. Secondary endpoints included identification of factors that pre-dispose a patient to **not** receive OMT. Demographics, presentation, and management were recorded. Medications were obtained from discharge documentation, and the medical record was screened for contraindications. A multivariable regression analysis was conducted and included: age, sex, race, ACS event, ACS management, and comorbidities with a priori alpha p< 0.05. All variables were analyzed independently, controlling for other variables.

**RESULTS:** Eight hundred and sixty-four patients were identified and 533 patients were excluded, with 331 patients analyzed. 231 patients (69.79%) received OMT. Groups less likely to receive OMT at discharge included: unstable angina OR 0.55[0.307-0.977], elderly OR 0.30[0.136-0.673], and surgical management OR 0.22[0.095-0.519].

**CONCLUSION:** OMT prescribing at an academic medical center in Oklahoma exceeded reports in literature. However, OMT prescribing remains sub-optimal. Development of quality projects to improve prescribing should focus on at risk populations.

**54E. The efficacy and safety of apixaban versus warfarin are preserved in patients with atrial fibrillation and extreme body weights: insights from the ARISTOTLE study** *Marat Fudim, MD*; Cardiology Fellowship, Duke University, Lawrenceville, NJ

Presented at the American College of Cardiology 2018, Orlando, Florida, March 11, 2018.

**55. Does body mass index influence warfarin dosing requirements? a retrospective cross-sectional study from Qatar** Eman Alhmoud, BSc, MSc, BCPS[1], Dana Bakdach, Pharm.D.[2], Mohamed Abdulgelil, MSc.[2], Walid Mekkawi, BSc, Diploma[2], *Eyad Almadhoun, MSc. Clinical Pharmacy, BCPS*[3]; [1]Pharmacy Department, Al Wakra Hospital- Hamad Medical Corporation, Doha, Qatar [2]Pharmacy Department, Hamad General Hospital- Hamad Medical Corporation, Doha, Qatar [3]Hamad General Hospital, Doha, Qatar

**INTRODUCTION:** More than 70 percent of Qatar's population is either overweight or obese. Evidence supporting effect of body mass index (BMI) on maintenance doses of warfarin and anticoagulation control is contradicting.

**RESEARCH QUESTION OR HYPOTHESIS:** Is there a correlation between BMI and weekly warfarin dose required to maintain a stable therapeutic INR? Could individual's BMI affect anticoagulation control, reflected by mean time in therapeutic range (TTR) and incidence of thromboembolic and/or bleeding events?

**STUDY DESIGN:** A retrospective cross sectional study.

**METHODS:** Adult patients receiving stable doses of warfarin, defined as having a therapeutic INR without a change in warfarin dose for at least 6 weeks, and attending ambulatory anticoagulation clinic in a tertiary hospital in Qatar, over one year period were included. Relevant data were collected through electronic chart review. TTR was calculated using Rosendaal method. BMI, was analyzed as a continuous and categorical variable (six BMI categories) and was correlated with warfarin dosing (total and mg/kg weekly dose) accordingly.

**RESULTS:** A total of 159 patients were included (57.9% males). BMI ranged between 14.3 – 61.8 kg/m$^2$ and mean TTR (± standard deviation) was 78 (± 18.2) A weak positive correlation was demonstrated between BMI and weekly warfarin maintenance dose (Pearson's r 0.186, P=0.019). No differences were observed in mean TTR across different BMI categories, (P-value =0.61). There was a weak negative correlation between BMI and weekly mg/kg warfarin dose (Pearson's r -0.22) with morbid and severely obese patients requiring lower doses compared to normal BMI group (P-value of 0.037 and 0.028 respectively). No thrombotic events were detected. Thirteen incidents of minor bleeding were reported, with insignificant differences across BMI categories (P=0.62).

**CONCLUSION:** A weak positive correlation exists between BMI and total weekly warfarin dose. No correlation was observed between BMI and anticoagulation control.

**56. Utilization and effectiveness of sacubitril/valsartan in a heart function clinic** *Arden Barry, BSc, BSc(Pharm), Pharm.D., ACPR*[1], Candy Lee, BSc(Pharm)[2], Gordon Klammer, BSc(Pharm), ACPR, BCPS[2], Dale Toews, BSc(Pharm), ACPR[2]; [1]Faculty of Pharmaceutical Sciences, University of British Columbia, Vancouver, BC, Canada [2]Pharmacy,

Abbotsford Regional Hospital and Cancer Centre, Abbotsford, BC, Canada

**INTRODUCTION:** Sacubitril/valsartan was evaluated in patients with heart failure (HF) with reduced ejection fraction in the PARADIGM-HF trial, which has questionable external validity due to strict inclusion criteria and an extensive run-in period. In-practice utilization and effectiveness of sacubitril/valsartan is unknown.

**RESEARCH QUESTION OR HYPOTHESIS:** How does use of sacubitril/valsartan in practice compare to the PARADIGM-HF trial?

**STUDY DESIGN:** Quantitative, retrospective/prospective health record review at a heart function clinic in Abbotsford, Canada.

**METHODS:** All HF patients aged ≥18 years were evaluated for use of sacubitril/valsartan. Data collected from July 2017-March 2018 included: age, sex, New York Heart Association (NYHA) classification, left ventricular ejection fraction (LVEF), concurrent medications, sacubitril/valsartan dose/titration, number/type of adverse effects, and rate/reason for discontinuation. The primary outcome was number of patients who met the PARADIGM-HF criteria. Analysis included descriptive statistics and paired t-test of means (IBM SPSS Statistics) with a level of significance of <0.05.

**RESULTS:** Forty-seven patients were included. Mean age was 68 years, 77% were male, 55% were NYHA class II, and 72% were on triple therapy. Only three patients met the PARADIGM-HF criteria – three patients did not meet the criteria and 41 had missing data, primarily lack of b-type natriuretic peptide (BNP) assessment. Mean achieved dose was 175 mg twice daily, and 67% achieved target dose (200 mg twice daily). There were significant improvements in mean LVEF (29.8% versus 38.1%, p<0.01) and NYHA classification (2.6 versus 2.2, p<0.01) from before initiating sacubitril/valsartan to achievement of target/maximally tolerated dose. Forty-two percent experienced an adverse effect, most commonly hyperkalemia and hypotension. Nine percent discontinued therapy.

**CONCLUSION:** Sacubitril/valsartan was well tolerated in practice with two-thirds of patients achieving target dose. However, most patients were initiated on sacubitril/valsartan without BNP assessment. Sacubitril/valsartan improved both objective and subjective measures of heart function. Though many patients experienced an adverse effect, it often did not lead to discontinuation.

**57. Comparison of preventive cardiovascular pharmacotherapy in surgical versus percutaneous coronary revascularization** *Arden Barry, BSc, BSc(Pharm), Pharm.D., ACPR*[1], Erica Wang, BSc(Pharm), Pharm.D., ACPR, BCPS[2], Doson Chua, BSc(Pharm), Pharm.D., BCPS (AQ Cardiology)[2], Glen Pearson, BSc, BScPhm, Pharm.D., FCSHP, FCCS[3]; [1]Faculty of Pharmaceutical Sciences, University of British Columbia, Vancouver, BC, Canada [2]Pharmacy, St. Paul's Hospital, Vancouver, BC, Canada [3]Division of Cardiology, University of Alberta, Edmonton, AB, Canada

**INTRODUCTION:** Data suggest patients who undergo coronary artery bypass graft surgery (CABG) have a lower rate of preventive cardiovascular pharmacotherapy use compared to percutaneous coronary intervention (PCI). However, these studies do not account for justified non-use (e.g., contraindication).

**RESEARCH QUESTION OR HYPOTHESIS:** What is the rate of utilization of preventive cardiovascular pharmacotherapy at discharge in CABG versus PCI patients post-acute coronary syndrome (ACS)?

**STUDY DESIGN:** Quantitative, prospective, longitudinal cohort study at St. Paul's Hospital in Vancouver, Canada.

**METHODS:** Consecutive patients aged ≥18 years discharged post-ACS after CABG or PCI between January-June 2018 were included. Data collected using REDCap database included: demographics, revascularization strategy, and preventive cardiovascular medication use (aspirin, P2Y12 inhibitors, beta-blockers, angiotensin-converting enzyme inhibitors/angiotensin receptor blockers [ACEI/ARBs] and statins) including adjustment for justified non-use. Statistical analyses (IBM SPSS Statistics) included t-test and chi-square test for continuous and categorical variables, respectively, with a significance level of <0.05.

**RESULTS:** One hundred and sixty patients were included. Mean age was 65 years and 83% were male. Comorbidities were similar between groups. Sixty-six percent presented with a non-ST-elevation ACS and 54% underwent CABG. More non-ST-elevation ACS patients underwent CABG versus PCI (70% versus 30%, p<0.01). While all patients were discharged on aspirin, more CABG patients received 325 over 80-81 milligrams (20% versus 1%, p<0.01). All PCI patients received a P2Y12 inhibitor (primarily ticagrelor) versus 24% of CABG patients (primarily clopidogrel). All CABG patients received a beta-blocker versus 97% of PCI patients. Use of ACEI/ARBs was higher in PCI versus CABG patients (99% versus 69%, p<0.01). Statin use was similar between groups (97% versus 99%, p=0.45), but more PCI patients received high-dose (91% versus 57%, p<0.01).

**CONCLUSION:** Use of aspirin and beta-blockers post-ACS was high in both groups. P2Y12 inhibitors and ACEI/ARBs were underutilized in CABG patients even after adjusting for contraindications. Additionally, CABG patients were less likely to receive high-intensity statin therapy.

**58. Evaluating patient instructions in a pharmacist-run home blood pressure monitoring program** *Michelle Jacobs, Pharm.D., CDE* and Jonathan Chen, BS in Pharmacy Studies; School of Pharmacy, Northeastern University, Boston, MA

**INTRODUCTION:** Home blood pressure (BP) monitoring is recommended for hypertension diagnosis confirmation and long-term follow up in US and international guidelines. Directions to best achieve this is mixed. It is generally recommended to check BP readings at home twice daily and to check multiple readings each time (2 or 3 readings) for several days. It is also recommended to discard the first day or the first of each triplicate readings. In an ambulatory care pharmacist-run home BP monitoring program, patient instructions are to take home BP in triplicate 2 times daily (AM and PM) for up to 10 days. The first reading of each triplicate is discarded when averaging the overall home BP.

**RESEARCH QUESTION OR HYPOTHESIS:** Is there a difference in the overall home BP average if the first day of readings are discarded or if the readings are measured as duplicates instead of in triplicate?

**STUDY DESIGN:** Retrospective analysis of 89 home BP monitoring patient records.

**METHODS:** Using ANOVA analysis, comparisons were evaluated between the overall home BP average taken in triplicate compared to an overall BP average if the first day was discarded or if readings were taken in duplicate.

**RESULTS:** Patients took home BP readings consecutively (AM and PM) 91% of the time, averaging 8.3 days and 15.4 triplicate readings. Overall average was 134/83 mmHg. When discarding the first day of readings, the overall average (132/83 mmHg) was lower but not statistically different. When overall BP average taken in triplicate was compared to being taken in duplicate (either averaging first 2 (135/84 mmHg) or last 2 (132/83 mmHg)) readings, results were not statistically different.

**CONCLUSION:** Patients who measure BP readings twice daily at home can achieve similar results if readings are taken in duplicate or triplicate and it is unlikely necessary to discard the first day of readings.

**59. Direct oral anticoagulant utilization and dosing in patients with non-valvular atrial fibrillation** *Arden Barry, BSc, BSc(Pharm), Pharm.D., ACPR*[1], Priscilla Shum, BSc(Pharm)[2], Gordon Klammer, BSc(Pharm), ACPR, BCPS[2], Dale Toews, BSc(Pharm), ACPR[2]; [1]Faculty of Pharmaceutical Sciences, University of British Columbia, Vancouver, BC, Canada [2]Pharmacy, Abbotsford Regional Hospital and Cancer Centre, Abbotsford, BC, Canada

**INTRODUCTION:** Direct oral anticoagulants (DOACs) are superior/non-inferior to warfarin for prevention of systemic embolism in patients with non-valvular atrial fibrillation (NVAF). However, uptake in practice is variable, and studies have shown DOAC dosing may be inconsistent with manufacturer labeling.

**RESEARCH QUESTION OR HYPOTHESIS:** How many patients with NVAF are discharged from hospital on a DOAC and what percentage received the correct dose?

**STUDY DESIGN:** Quantitative retrospective health record review at Abbotsford Regional Hospital in Abbotsford, Canada.

**METHODS:** Included were patients aged ≥18 years with NVAF (based on ICD-10) and CHADS-65 score ≥1. Data collected from April-September 2017 included: demographics, comorbidities, CHADS-65 and HAS-BLED scores, and discharge anticoagulant (if applicable). The primary outcome was percentage of patients prescribed a DOAC (apixaban, dabigatran, edoxaban, rivaroxaban) on discharge. Secondary outcomes included patient characteristics associated with DOAC versus warfarin use and percentage of patients prescribed the correct DOAC dose. Statistical analyses with Microsoft Excel included t-test and chi-square/Fisher's exact test for continuous and categorical variables, respectively, with a significance level of $<0.05$.

**RESULTS:** One hundred and twenty patients were included. Mean age was 79 years and 55% were male. Eight-three patients (69%) were prescribed a DOAC, 25 patients (21%) were prescribed warfarin, and 12 patients (10%) were not prescribed an anticoagulant. There were no significant differences in patient characteristics between DOAC and warfarin groups including mean CHADS-65 score (2.8 versus 3.1, p=0.30) and HAS-BLED score (1.5 versus 1.6, p=0.87). Common DOACs were apixaban (42/83) and rivaroxaban (38/83). Of those prescribed a DOAC, 13% did not receive the correct dose – 8% and 5%, respectively, received a dose that was lower or higher than recommended.

**CONCLUSION:** Over two-thirds of patients with NVAF were prescribed a DOAC on discharge, and had similar thromboembolic and bleeding risks compared to those prescribed warfarin. Of the patients prescribed a DOAC, approximately one out of 10 did not receive the correct dose.

**60. Implementation of a pharmacist-led amiodarone monitoring service (AMS) at a veterans affairs health care system** *Jisha Jacob, Pharm.D.*[1], Tiffany Tsai, Pharm.D.[1], Jessina C. McGregor, Ph.D.[1], Merritt Raitt, MD[2], Harleen Singh, Pharm.D.[1]; [1]College of Pharmacy, Oregon State University/Oregon Health & Science University, Portland, OR [2]Cardiology, Veterans Affairs Portland Health Care System (VAPORHCS), Portland, OR

**INTRODUCTION:** Appropriate serial monitoring of chronic amiodarone use can be challenging in clinical practice. At VAPORHCS, only 60% patients received guideline-directed monitoring. Evidence suggests that pharmacist-led AMS can improve adherence to monitoring guidelines and identification of amiodarone-related adverse effects.

**RESEARCH QUESTION OR HYPOTHESIS:** The objective is to evaluate the effectiveness of pharmacist-managed amiodarone clinic to improve guideline-directed monitoring.

**STUDY DESIGN:** Retrospective analysis of a quality-improvement initiative

**METHODS:** In January 2018, a pharmacist run clinic in collaboration with a multidisciplinary team was established for ongoing amiodarone monitoring. All patients who filled a prescription for amiodarone in 2017 were identified for review. Patients actively followed by an outside provider, under hospice care, no longer taking amiodarone were excluded. Charts were extracted for medication adherence, drug-drug interactions, thyroid function and liver function tests every six months and annual EKG (per local cardiology preference). Data collected includes: demographics, indication, dose and duration of amiodarone therapy, frequency of follow-up monitoring. If any monitoring parameters were determined to be missing, pharmacists would place orders directly or alert the appropriate provider. Descriptive statistics were used to quantify the number and types of pharmacist interventions. The Institutional Review Board approved as a quality-improvement project.

**RESULTS:** To date, 60 patients were reviewed and 11 patients were excluded. Forty percent of the patients were overdue for either lab or EKG monitoring and 26% either needed refills or had an expired prescription. A total of 133 interventions have been recommended so far. Primary interventions included medication counseling and lab orders

for 27 patients (55%), scheduling of EKGs for 15 patients (30%), and scheduling of provider follow-ups for 10 patients (20%).

**CONCLUSION:** Our findings demonstrate that utilization of pharmacists within a multidisciplinary clinic can help improve rates of amiodarone monitoring. Furthermore, this also highlights the need to establish site-specific monitoring protocol to ensure timely monitoring.

**61. Tolerance of sacubitril-valsartan in African American patients with heart failure with reduced ejection fraction** Claire Carpenter, Pharm.D.[1], *Kelsey Fletcher, Pharm.D. Candidate*[1], Ian B. Hollis, Pharm. D.[2], Zachariah M. Deyo, Pharm.D.[2]; [1]Eshelman School of Pharmacy, University of North Carolina, Chapel Hill, NC [2]University of North Carolina Hospitals, Chapel Hill, NC

**INTRODUCTION:** The PARADIGM-HF trial showed sacubitril-valsartan to be more effective than angiotensin converting enzyme inhibition in preventing hospitalizations and mortality in patients with HFrEF. However, African Americans (AA) comprised only 5.1% of the treatment group, limiting our understanding of sacubitril-valsartan in this population.

**RESEARCH QUESTION OR HYPOTHESIS:** Do African Americans exhibit significant differences relative to other races tolerating titration to target dose of sacubitril-valsartan?

**STUDY DESIGN:** Single-center, retrospective electronic medical record review

**METHODS:** A total of 246 patients with sacubitril-valsartan prescriptions between 1/1/15-5/31/17 were identified using our institution's electronic data warehouse. After excluding 140 patients due to lack of follow up, inability to afford the medication, patient refusal of initiation, or death, the remaining 106 patients were divided into African American and other race and followed during titration of sacubitril-valsartan until target dose was achieved or titration failed by 1/2018. The primary endpoint, achievement of target dose, and secondary endpoint, pharmacist impact on achieving target dose, were analyzed using the Chi Square test. Time to achieve target dose and number of clinic visits required were analyzed using the Mann Whitney test.

**RESULTS:** Of the 106 included patients, 34 achieved target dose. There was no significant difference between the percentage of AA (30.4%) vs. non-AA (32.5%) patients achieving target dose (p=0.849), time to achievement of target dose (118.71 days, AA vs. 83.85 days, non-AA, p=0.766), or number of clinic visits required to achieve target dose (4.1, AA vs. 3.6, non-AA, p=0.554). Of patients receiving pharmacist care, 56.7% achieved target dose, compared with 22.3% of patients who did not receive pharmacist care (p =0.001).

**CONCLUSION:** In this retrospective review, African Americans did not differ significantly in achievement of target dose of sacubitril-valsartan. To prevent under-representation and ensure clinical applicability, the inclusion of greater proportions of African Americans in future sacubitril-valsartan clinical trials is essential.

**62. Predicting bleeding and thrombosis complications in patients with continuous flow left ventricular assist devices** *Kyle Zacholski, Pharm.D.*[1], Adam Sieg, Pharm.D.[1], William Kuan, Pharm.D.[2], Justin McCann, Pharm.D. Candidate 2018[3], Aaron Cook, Pharm.D.[4], Aric Schadler, BS, MS[5], Sara Parli, Pharm.D.[4]; [1]Department of Pharmacy, University of Kentucky Healthcare, Lexington, KY [2]Department of Pharmacy Services, University of Kentucky Healthcare, Lexington, KY [3]University of Kentucky School of Pharmacy, Lexington, KY [4]Department of Pharmacy, University of Kentucky HealthCare, Lexington, KY [5]School of Pharmacy, University of Kentucky School of Pharmacy, Lexington, KY

**INTRODUCTION:** Left ventricular assist device (LVAD) therapy has been proven to relieve heart failure symptoms and improve survival, but is associated with complications such as bleeding and thrombotic events. Risk stratification tools have been utilized in other cardiovascular disease populations to estimate the risk of bleeding and thrombosis with and without anticoagulation, including the HAS-BLED, HEMORR2HAGES, CHADS2 and CHA2DS2-VASc models. It is unknown whether these tools are predictive in patients with LVADs.

**RESEARCH QUESTION OR HYPOTHESIS:** The study objective was to evaluate the predictive value of risk models for bleeding and thrombotic complications in patients with an LVAD.

**STUDY DESIGN:** Retrospective cohort analysis

**METHODS:** This was a retrospective, single-center analysis of patients implanted with a continuous-flow LVAD from July 2011 to June 2016. All patients who received an LVAD within the study period were eligible for inclusion. The primary endpoint was the incidence of bleeding or thrombosis events within one year from implantation. Baseline risk model scores were calculated at time of LVAD implantation. Chi-square and student's t-test were used to measure baseline differences and compare mean risk model scores between patients who had an event. A receiver operator characteristic (ROC) curve analysis was performed to evaluate the accuracy of the risk models to predict an event.

**RESULTS:** A total of 129 patients underwent LVAD implantation within the study time period. Mean CHADS2, CHA2DS2-VASc, and HAS-BLED scores were not statistically significantly different in those with and without an event. The mean HEMORR2HAGES score was 3.09 and 2.51 in those with and without a bleeding event, respectively (p = 0.008). The ROC curve area for the HEMORR2HAGES model was the highest at 0.620.

**CONCLUSION:** The HEMORR2HAGES model was the only model associated with an event. None of the models had strong positive predictive value, suggesting that a better risk model is needed to predict bleeding and thrombotic events in these patients.

**63. Captopril versus hydralazine-isosorbide dinitrate vasodilator protocols in acute decompensated heart failure patients transitioning from sodium nitroprusside** *Mohamed Amar, Pharm.D., BCPS*[1], Simon W. Lam, Pharm.D., FCCM, BCPS, BCCCP[2], Kathleen D. Faulkenberg, Pharm.D., BCPS[2], J. Bradley Williams, Pharm.D., BCPS[2]; [1]Deparment

of Pharmacy, Cleveland Clinic Foundation, Cleveland, OH [2]Department of Pharmacy, Cleveland Clinic, Cleveland, OH

**INTRODUCTION:** The role of oral vasodilators in the transitional management of acute decompensated heart failure (ADHF) is not clearly defined. This study will compare the use of captopril vs. hydralazine-isosorbide dinitrate (H-ISDN) in the transition from intravenous vasodilator therapy in acutely decompensated HFrEF patients.

**RESEARCH QUESTION OR HYPOTHESIS:** Is the time required to wean off intravenous vasodilators significantly affected by oral vasodilator selection in ADHF patients? Does inpatient oral vasodilator selection affect chronic therapies prescribed at discharge?

**STUDY DESIGN:** Retrospective, cohort, single center study.

**METHODS:** Retrospective chart review of adult patients admitted with ADHF from 2010 to 2016 who required sodium nitroprusside (SNP) and received either captopril or H-ISDN was performed. Captopril patients were matched 1:2 to H-ISDN patients, based on serum creatinine (SCr) and ethnicity. The primary endpoint is time to SNP discontinuation after initiation of oral vasodilator. Secondary outcomes include ICU and hospital length of stay (LOS), vasodilator prescribed at discharge, mortality and rehospitalization at one year post discharge.

**RESULTS:** In total, 369 patients were included. Baseline demographics, serum chemistry, and use of ACE-I/ARB were similar between groups. Time to SNP discontinuation (46.9 vs 40.4 hours, p=0.11), ICU LOS (5.5 vs 5.0 days, p=0.19), and hospital LOS (12.5 vs 11.7 days, p=0.49) were similar between the captopril and H-ISDN groups. Fewer H-ISDN protocol patients were discharged on an ACE-I/ARB (82.9 % vs 69.9%, p=0.003) despite similar kidney function at time of discharge (SCr 1.1 vs 1.2, p=0.11). Numerically, less patients in the captopril protocol group were deceased or required rehospitalization within 1 year (49% vs. 56%, p=0.18).

**CONCLUSION:** No significant differences were observed in the time to wean SNP, or hospital or ICU LOS, between groups. Fewer patients who received the H-ISDN protocol were discharged on ACE-I/ ARB therapy. Vasodilator selection during acute care may impact agent selection during chronic care, which may have implications on mortality.

**64. Assessment of direct oral anticoagulant use for initial treatment of venous thromboembolism** *Carrie Oliphant, Pharm.D., FCCP, BCPS-AQ Cardiology, AACC*[1], Brennan Herrmann, Pharm.D.[2], Anna Jacobs, Pharm.D.[3], Katherine L. March, Pharm.D., BCPS[4]; [1]Department of Pharmacy, Methodist University Hospital, Memphis, TN [2]Methodist University Hospital, Memphis, TN [3]Department of Pharamcy, Methodist University Hospital, Memphis, TN [4]Department of Clinical Pharmacy, Methodist University Hospital, Memphis, TN

**INTRODUCTION:** According to the most recent CHEST guideline on Antithrombotic Therapy in venous thromboembolism (VTE), direct oral anticoagulant (DOAC) therapy is recommended over vitamin K antagonists (warfarin) as the initial therapy choice for treatment of VTE without cancer (Grade 2B).

**RESEARCH QUESTION OR HYPOTHESIS:** What is the guideline adherence rate for treatment of a newly diagnosed VTE within a large healthcare system?

**STUDY DESIGN:** Multisite, retrospective study

**METHODS:** A retrospective chart review of patients discharged on an oral anticoagulant for the treatment of a newly diagnosed lower extremity deep venous thromboembolism (DVT) and/or pulmonary embolism (PE) from January 2016-December 2017 was conducted. The primary outcome was treatment guideline adherence (DOAC use) at discharge. Secondary outcomes were length of stay, 90-day anticoagulation related readmission, appropriate DOAC dosing and guideline adherence based on facility and prescriber. An additional analysis in the warfarin group was performed to identify potential barriers to prescribing DOAC therapy. Comparisons were made using chi-squared/Fisher's exact test and Mann-Whitney U/t-test as appropriate.

**RESULTS:** A total of 300 patients were included, with 73.7% receiving DOAC and 26.3% receiving warfarin for VTE treatment at discharge. Length of stay in the DOAC arm was significantly shorter compared to warfarin (2.2 days vs 6.0 days; p<0.001). Appropriate DOAC dosing was observed in 84.2% patients. All instances of incorrect DOAC dosing was due to under dosing. The rate of 90-day anticoagulation related readmission was similar (5.8% vs 3.8%; p=0.574). The most common potential barriers to prescribing DOAC therapy (n=79) were state or federal prescription insurance (63.2%), no prescription insurance (21.5%), and creatinine clearance <30 mL/min (17.7%).

**CONCLUSION:** The results of this study indicate a high guideline adherence rate in the treatment of acute VTE. Patient access appears to be a limiting factor for the utilization of DOAC therapy in the treatment of VTE.

**65E. Evaluation of heart failure transitions of care via distance health technology** *Ramone Boyd, Pharm.D.*[1], Brittany Florczykowski, Pharm.D.[2], Kimberly Bischel, RN[3], Caleb Balduff, Pharm.D. Candidate[4], Daniel Lewis, Pharm.D.[5]; [1]Department of Pharmacy, Cleveland Clinic, Cleveland, OH [2]Pharmacy, UPMC Pinnacle Health, Harrisburg, PA [3]Heart and Vascular Institute, Cleveland Clinic, Cleveland, OH [4]Cleveland Clinic, Cleveland, OH [5]Pharmacy, Cleveland Clinic, Cleveland, OH Presented as research-in-progress at American College of Clinical Pharmacy Annual Meeting, Phoenix, AZ, October 07-10, 2017.

**66. Mono versus dual antiplatelet therapy for secondary stroke prevention: a study focused on the African American population** *Amir Zaki, Pharm.D. Candidate*[1], Amne Borghol, Pharm.D., BCPS[2], Gabriela Andonie, Pharm.D. Candidate[1], Alison Neuliep, Pharm.D. Candidate[1], Ahmed Zaki, Pharm.D. Candidate[1], Bree Bergeron, Pharm.D. Canddidate[1], Mikee Castro, Pharm.D. Candidate[1]; [1]College of Pharmacy, Xavier University of Lousiana, New Orleans, LA [2]College of Pharmacy, Division of Clinical and Administrative Sciences., Xavier University of Louisiana, New Orleans, LA

**INTRODUCTION:** The purpose of this project was to evaluate the benefit and efficacy of dual versus mono antiplatelet therapy in reducing stroke recurrence and mortality in patients with ischemic stroke or transient ischemic attack (TIA) with an emphasis on African-American patients.

**RESEARCH QUESTION OR HYPOTHESIS:**

- To assess the efficacy of dual antiplatelet therapy versus monotherapy in reducing recurrent stroke and mortality
- To compare the incidence of bleeding in patients receiving dual therapy versus monotherapy
- To compare incidence of recurrent stroke and mortality in African-American patients compared to non African-American patients

**STUDY DESIGN:** This study was a single-center, retrospective, chart review, cohort study conducted at the University Medical Center in New Orleans, LA. The study included all patients admitted to UMCNO with a diagnosis of non-cardioembolic stroke or TIA since 2013.

**METHODS:** Data was collected via retrospective chart review. Statistical analyses were performed using SPSS version 17.

**RESULTS:** A total of 764 stroke patients were evaluated:501 (65.6%) of the patients received monotherapy of either aspirin or clopidogrel and 263 (34.4%) of patients received dual therapy which included two antiplatelet medications. The majority of the patients in both the mono and dual therapy groups were African-American (78.8%,81.0%) and male (56.7%,53.2%), respectively. Based on the outcomes between the monotherapy versus dual therapy, there was no significant difference in recurrent stroke and mortality. Although the outcomes weren't significant (p-value=0.218), there was a higher recurrent stroke frequency within a year in the monotherapy group of 6.2% versus 3.7% in the dual group. There was a nearly significant higher bleeding event associated with dual therapy of 6.3% versus 2.8% in the monotherapy group (p-value=0.05).

**CONCLUSION:** This study found no significant difference with the use of dual antiplatelet therapy compared to monotherapy. There is a need for more studies to evaluate the benefits of dual therapy in ischemic stroke patients and specifically in the African American population.

**67. Association of west African genetic ancestry and blood pressure control among African Americans with treated hypertension in the Jackson heart study** *Jon Van Tassell, MPH*[1], Diachi Shimbo, MD[2], Rachel Hess, MD, MS[3], Rick Kittles, Ph.D.[4], James Wilson, MD[5], Lynn Jorde, Ph.D.[6], Man Li, Ph.D.[7], Leslie Lange, Ph.D.[8], Ethan Lange, Ph.D.[8], Paul Muntner, Ph.D.[9], Adam Bress, Pharm.D., MS[10]; [1]College of Pharmacy, University of Utah, Salt Lake City, UT [2]Dept of Med Beh Cardiology, Columbia University, New York, NY [3]Division of Health System Innovation and Research, University of Utah, Salt Lake City, UT [4]Division of Health Equities, Department of Population Sciences, City of Hope, Duarte, CA [5]Mississippi Center for Clinical and Translational Research, University of Mississippi Medical Center, Jackson, MS [6]Department of Human Genetics, University of UTah, Salt Lake City, UT [7]Department of Nephrology, University of Utah, Salt Lake City, UT [8]School of Medicine Division of Biomedical Informatics and Personalized Medicine, University of Colorado Denver, Aurora, CO [9]School of Public Health, University of Alabama at Birmingham, Birmingham,, AL (10)Department of Population Health Sciences, University of Utah, Salt Lake City, UT

**INTRODUCTION:** Despite increasing hypertension awareness and treatment rates, African Americans have significantly lower blood pressure (BP) control rates compared to European Americans. It is unclear if racial differences in antihypertensive medication responses or pharmacogenetic variants that have different frequencies by ancestral groups, contribute to this disparity.

**RESEARCH QUESTION OR HYPOTHESIS:** Higher west African ancestry (WAA) will be associated with a lower prevalence of BP control among Jackson Heart Study participants with treated hypertension.

**STUDY DESIGN:** Cross-sectional

**METHODS:** We analyzed 1,658 participants with treated hypertension who reported taking all of their antihypertensive medications in the previous 24 hours at Exam 1. Percent WAA was determined from 389 ancestry informative markers and categorized into quartiles (1: <73.7%, 2:≥73.7%-81.0%, 3:≥81.0%-86.3% and 4:>86.3%). BP control was defined as systolic/diastolic BP of <140/90 mmHg. We calculated adjusted prevalence ratios (PR) for BP control associated with the 3 upper quartiles, separately, versus the lowest quartile of WAA.

**RESULTS:** The mean age was 60.0±10.8 years, 67.5% were female, and the overall BP control rate was 75.6%. Adjusted PRs (95%CI) for BP control comparing quartile 2, 3, and 4 to those in quartile 1 of percentage WAA were 0.98 (0.84-1.15), 0.94 (0.80-1.09) and 0.86 (0.71-1.04), (p-trend 0.437). Among those taking an angiotensin-converting-enzyme inhibitor or an angiotensin receptor blocker as monotherapy, adjusted PRs (95%CI) for BP control were 0.77 (0.58-1.01), 0.85 (0.64-1.13) and 0.73 (0.50-1.06) (p-trend 0.663), comparing quartile 2, 3, and 4 to those in quartile 1 of WAA, respectively.

**CONCLUSION:** Among African Americans with treated hypertension, BP control rates were not different across quartiles of WAA. The lack of association between genetic ancestry and BP control may indicate differences in clinical inertia and social, cultural or environment factors. Future studies should examine BP control rates and WAA among those taking ACE or ARB monotherapy.

## COMMUNITY PHARMACY PRACTICE

**68. Risk assessment of prescribing errors on medical prescriptions in Malta and Germany** Jeffrey I. Kupka, R.Ph. (Germany), Pharm.D. Student, Maurice Zarb-Adami, B.Pharm., B.Pharm.(Hons)(Lond.), Ph.D., Maresca Attard Pizzuto, B.Pharm (Hons), M.Sc. (Clinical Pharmacy), Ph.D. and *Anthony Serracino-Inglott, B.Pharm., Pharm.D.(Cinc.), M.A.C.C.P., M.R.Pharm.S.*; Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Msida, Malta

**INTRODUCTION:** Errors on a physician's prescription may lead to erroneous dispensing by the pharmacist. A risk assessment of errors arising from prescriptions in Malta and Germany was undertaken.

**RESEARCH QUESTION OR HYPOTHESIS:** To assess the risk of prescribing errors by physicians from the perspective of physicians and pharmacists.

**STUDY DESIGN:** Prospective qualitative and quantitative study design.

**METHODS:** Interviews with physicians were conducted to describe the medical use process in both countries. Two questionnaires, one for physicians and one for pharmacists were developed and validated by 16 experts. Both professions were asked to assess root causes for errors that were discussed in physician's interviews and to rank potential prescribing errors on a scale of 1 (low score) – 4 (high score) by their probability and severity to get an overall 'Risk Priority Number' (RPN) (1 – 4 low risk) (6 medium risk) (8 – 16 high risk).

**RESULTS:** One hundred and ninety one physicians (94 Malta, 97 Germany) and 177 pharmacists (74 Malta, 103 Germany) answered the questionnaire respectively. Prescribing errors due to illegible handwriting (RPN of 6.71 for physicians, 8.42 for pharmacists) and continuing the prescription for a longer duration than necessary (RPN of 5.69 for physicians, 7.82 for pharmacists) were rated as the two highest risks leading to potential dispensing errors in Malta. Physicians and pharmacists in Germany rated the continuing prescriptions as their highest risk with a score of 5.3 (physicians) and 7.42 (pharmacists).

**CONCLUSION:** In both countries an uncontrolled duration of a medication is seen as one of the highest risks. In Malta, the physician's handwriting is viewed as the main source of prescribing errors. This error is not an issue in Germany as prescriptions are issued electronically. Risk minimisation strategies to address these risks include the use of electronic software.

**69. Expanding adolescent contraceptive access to pharmacies: predictors of adolescent willingness to utilize pharmacist prescribing** *Ashley Meredith, Pharm.D.*[1], Tracey Wilkinson, MD, MPH[2], Thomas Vielott, BS[3], Carolyn Meagher, BA[2], Mary Ott, MD, MA[2]; [1]Purdue University College of Pharmacy, Indianapolis, IN [2]Indiana University School of Medicine, Indianapolis, IN [3]Division of Adolescent Medicine, Indiana University School of Medicine, Indianapolis, IN

**INTRODUCTION:** Legislation in multiple states allows pharmacists to prescribe contraception, expanding access by eliminating the provider visit. Most restrict prescribing to adults. Few data examine adolescent acceptability of pharmacist prescribing.

**RESEARCH QUESTION OR HYPOTHESIS:** What factors influence adolescents' desire to obtain contraception through pharmacist prescribing?

**STUDY DESIGN:** Prospective, observational survey

**METHODS:** After IRB approval, females ages 14-21 were recruited from general and subspecialty clinics. Participants completed a demographic, behavioral, and health survey, including 2 items assessing acceptability of pharmacist prescribing and whether acceptability changes when they were made aware that counseling from a pharmacist was part of the protocol. Responses were coded "Yes" if either item was answered affirmatively. A screening checklist for potential contraindications to contraception per CDC Medical Eligibility Criteria was completed. Bivariate analysis and multivariate logistic regression examined the effects of age, race, insurance, chronic illness, presence of a medical contraindication, sexual experience, perceived risk of pregnancy, and birth control use on acceptability.

**RESULTS:** 302 adolescents participated: 175(57.9%) from general clinics, mean age 16.6±2 yrs, 98(32.5%) had sex, 119(39.4%) used hormonal contraception, and 23(7.6%) used an IUD/implant. 135 (44.7%) answered yes to one of the questions regarding pharmacy acceptability. Adolescents were more likely to respond "yes" if they were older (16.9±2.4 yrs vs. 16.3±1.7 yrs; p=0.032) and did not use condoms during last sex (p=0.027). No other characteristic was found to be statistically significant in logistic regression.

**CONCLUSION:** Almost half of adolescent participants expressed a desire to obtain contraception through a pharmacist. Results were not influenced by presence of a potential contraindication, sexual experience, and use of birth control. These data illustrate a need for additional outreach to adolescents related to pharmacy access, and emphasize the need for a rigorous screening process by pharmacists.

**70. Consumers' knowledge, attitudes and practices (KAP) of pain management – an age-related comparison study on self-management in Singapore** *Zhi Wei Lim, BSc(Pharm)(Hons) Candidate*[1], Heng Boon Ong, Pharm (Hons)[2], Boon Ka Chong, MSc (Comm Pharm), CGP[3], Kai Zhen Yap, Ph.D.[1]; [1]Department of Pharmacy, National University of Singapore, Singapore, Singapore [2]Watsons Personal Care Stores Pte Ltd, Singapore, Singapore [3]Department of Pharmacy, Watson's Personal Care Stores Pte Ltd, Singapore, Singapore

**INTRODUCTION:** Recent reclassifications of analgesics in Singapore have increased consumers options for self-management of pain. Despite being one of the most common self-treated indication, limited studies have assessed consumers' knowledge, attitudes and practices (KAP) of pain management and the possible differences that may exist between age groups.

**RESEARCH QUESTION OR HYPOTHESIS:** What are consumers' KAP of pain management and how do they compare across age groups?

**STUDY DESIGN:** This study involved a cross-sectional interviewer-administered survey.

**METHODS:** This survey targeted a minimum of 384 walk-in customers at Watsons Personal Care Stores, a major retail pharmacy chain in Singapore. Convenience sampling with geographical quota was employed to recruit respondents during January to March 2018, from across Singapore's five Urban Redevelopment Authority planning regions based on geographical distribution of the population. Non-citizens, non-permanent residents, pregnant mothers, healthcare professionals or students, Watsons employees and non-English speaking respondents were excluded. All responses were analysed using Friedman, Wilcoxon signed ranks, Kruskal-Wallis and Man-Whitney U tests where applicable.

**RESULTS:** Among 397 respondents recruited, knowledge scores on product information for headaches and musculoskeletal pain were low (median = 2 out of 6). Respondents rarely consulted community pharmacists despite reporting greatest trust in healthcare professionals as the most reliable source of information among all other sources ($p<0.00238$, with Bonferroni corrections). While respondents preferred to self-treat rather than seeing a physician, convenience was a key factor for self-management of pain among younger individuals (21 – 40 years' old) compared to those in the older age groups ($p<0.00167$, with Bonferroni corrections).

**CONCLUSION:** This study provided insights to healthcare consumers' perceptions, and may be useful for policy makers and service providers in developing targeted interventions to ensure safe and effective self-treatment of painful conditions for different age groups.

**71. Evaluation of a community pharmacy-based travel health clinic on patient understanding and satisfaction** Erica Wilkinson, Pharm. D.[1], *Amy Robertson, Pharm.D.*[2], Brent Rohling, Pharm.D.[3], Jacob Hadley, Pharm.D.[4], Dean Benton, Pharm.D.[5], Abby Winter, Pharm.D.[6]; [1]University of Kansas School of Pharmacy / Dillons Pharmacy, Wichita, KS [2]Department of Pharmacy Practice, University of Kansas School of Pharmacy, Wichita, KS [3]Dillons Pharmacy, Hutchinson, KS [4]2800 East 4th Ave, Dillons Pharmacy, Hutchinson, KS [5]Dillons Pharmacy, Wichita, KS [6]University of Washington Diabetes Care Center, Seattle, WA

**INTRODUCTION:** Individuals who decide to travel internationally have a lot to prepare for and community pharmacists are well equipped to serve as a vital source of travel health information. High accessibility, comprehensive hours, and drug expertise make community pharmacists excellent candidates to serve as travel health experts. Implementation of a travel health clinic in a community pharmacy setting will allow patients to obtain oral travel medications, vaccines, over-the-counter supplies, and counseling for travel-related risks and prevention strategies in one visit.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the impact of pharmacist-led international travel health consultations on patient understanding?

**STUDY DESIGN:** This was a survey study conducted at Dillons Pharmacy in Wichita, KS from January 1, 2018 to June 1, 2018.

**METHODS:** Adults with international travel planned within the next three months were included. Patients were excluded from the study if they were pregnant or immunocompromised. The primary outcome was the change in patient understanding of travel health information from baseline to post-consultation. Secondary outcomes evaluated patient satisfaction as well as perceived monetary value of the service. These objectives were measured with questionnaires using a 5-point Likert scale. A questionnaire was administered to study participants before and after the consultation. The study outcomes were analyzed using Student's t-test and descriptive statistics, as appropriate.

**RESULTS:** A total of twelve patients were evaluated. There was a significant positive difference in patient understanding on all five questions assessing patient knowledge of travel health information ($p<0.001$). The acceptance rate of vaccines recommended was 65% (11/17). The acceptance rate of oral medications recommended was 50% (2/4). A total of 49 over-the-counter products were recommended. The mean perceived value of the service provided was $48 (range $25-75).

**CONCLUSION:** Pharmacist-led travel health consultations improved patient understanding of travel health information.

## CRITICAL CARE

**72. Inappropriate continuation of stress ulcer prophylaxis following discharge from the medical intensive care unit** *Mikhaila Rice, BSPS*[1], Katherine Chin, MD[2], Bryan McVerry, MD[2], Pamela L. Smithburger, Pharm.D., MS, BCCCP, FCCP[3]; [1]University of Pittsburgh School of Pharmacy, Pittsburgh, PA [2]UPMC Presbyterian, Pittsburgh, PA [3]Department of Pharmacy and Therapeutics, University of Pittsburgh School of Pharmacy, Pittsburgh, PA

**INTRODUCTION:** Patients in the medical intensive care unit often (MICU) require stress ulcer prophylaxis; however, acid-suppressive medications may be inappropriately continued following discharge from the MICU. Literature highlights complications associated with prolonged acid-suppressive medication use, and, as such, these medications should be discontinued at transitions of care when no longer indicated.

**RESEARCH QUESTION OR HYPOTHESIS:** The purpose of this study was to identify contributing factors for inappropriate continuation of stress ulcer prophylaxis following discharge from the MICU.

**STUDY DESIGN:** This was part of a quality improvement project utilizing a retrospective cohort review of consecutive patients completed at UPMC Presbyterian Hospital.

**METHODS:** Patients were included if they were ordered a proton pump inhibitor or histamine-2 receptor antagonist in the MICU between May and August 2017. Patients were excluded if they were admitted to the MICU for fewer than 48 hours, were on acid-suppressive medications prior to admission, or had a gastrointestinal bleed. Descriptive statistics and a multivariate logistic regression, including covariates of age, mechanical ventilation status, MICU length of stay, and time discharged from MICU, were used to analyze the primary outcome of acid-suppressive therapy continuation at discharge.

**RESULTS:** Of the 41 patients included, 33 (80%) were appropriately prescribed stress ulcer prophylaxis. Acid-suppressive medications were inappropriately continued in 21 (51%) following discharge from the MICU, and in 15 (37%) following discharge from the hospital. A one hour increase in length of stay was associated with a 1% increase in the odds of continuation of acid-suppressive medications following discharge from MICU (OR 1.010; $p=0.02$).

**CONCLUSION:** While stress ulcer prophylaxis was typically initiated appropriately in the MICU, it was inappropriately continued upon discharge from the MICU in half of patients demonstrating a need for greater attention to detail in the transitions of care process. This is especially important following extended MICU stays, as likelihood of inappropriate continuation increases with increased length of stay.

**73E. Incidence of neurobehavioral side effects associated with levetiracetam and phenytoin in traumatic brain injury: a retrospective cohort study** *Tian Yaw, Pharm.D.*, Jerika Nguyen, Pharm.D. and Holly Anderson, Pharm.D.; Department of Pharmacy, Oregon Health & Science University, Portland, OR

Presented at Northwestern States Pharmacy Residents Conference, Portland OR, May 12, 2018.

**74. Validation of a medication regimen complexity scoring tool (MRC-ICU) for critically ill surgical patients** *Andrea Sikora Newsome, Pharm.D., BCPS, BCCCP*[1], Tiffany Park, Doctor of Pharmacy[2]; [1]Department of Pharmacy, UGA College of Pharmacy, Augusta, GA [2]UGA College of Pharmacy, North Augusta, SC

**INTRODUCTION:** Justification of critical care pharmacist positions in the intensive care unit (ICU) remains a common challenge due to limited objective measures regarding pharmacist productivity. The MRC-ICU was developed and validated in the medical intensive care unit (ICU) population to measure medication regimen complexity and was associated with patient acuity, ICU length of stay LOS), and mortality.

**RESEARCH QUESTION OR HYPOTHESIS:** The purpose of this study is to validate the MRC-ICU in critically ill surgical patients and explore relationships with patient specific outcomes.

**STUDY DESIGN:** This study was a prospective, observational review of patients in the surgical ICU.

**METHODS:** Patients were identified using unit census reports between August 2016 and September 2017. All patients ≥ 18 years located in the surgical ICU were included. Patients were excluded if the length of stay was less than 24 hours due to either death or transfer or had active transfer or hospice orders at 24 hours. Demographics included age, sex, ICU LOS, and inpatient mortality. Differences in MRC-ICU scores with inpatient mortality was examined using a two-sample t-test, and the Pearson Product Moment was used to determine the correlation of MRC-ICU score with ICU LOS, weight, and number of medications ordered.

**RESULTS:** Mean ICU LOS was 5.8 ± 6.3 days. Inpatient mortality was 30% (9/30), and mean MRC-ICU score was 15.8 ± 6.9. Convergent validity was confirmed by correlation of number of medications and orders to MRC-ICU ($p=0.0158$, $p < 0.0001$). Discriminant validity was confirmed by lack of correlation to weight ($p = 0.7034$). A positive correlation with MRC-ICU score and ICU LOS was observed ($p = 0.0331$).

**CONCLUSION:** The MRC-ICU correlated with ICU LOS but mortality could not be confirmed. These findings indicate that MRC-ICU may be used in both medical and surgical populations. Future studies will focus on generalizability to other institutions and relationship to pharmacist activity.

**75E. Evaluation of continuation rate of antipsychotics for delirium treatment upon discharge from the intensive care unit: a retrospective chart review** *Deepali Dixit, Pharm.D., BCPS*[1], Zahava Picado, Pharm.D.[2], Raphaela Nisenzone, Pharm.D.[3]; [1]Critical Care, Robert Wood Johnson University Hospital, New Brunswick, NJ [2]North Brunswick, NJ [3]New Brunswick, NJ

Presented at the American Society for Health System Pharmacists' Midyear Clinical Meeting, Orlando, Fl, December 6, 2017.

**76. Prevention of chronic pain with the use of continuous infusion ketamine in acute trauma related pain** *Cara Coleman, Pharm.D., BA*[1], Paige Garber, Pharm.D.[2], Molly Droege, Pharm.D.[2], Carolyn Philpott, Pharm.D.[2], Dennis Hanseman, Ph.D.[3], Vanessa Nomellini, MD, Ph.D.[3], Christopher Droege, Pharm.D.[2]; [1]University of Cincinnati College of Pharmacy, Cincinnati, OH [2]University of Cincinnati Medical Center, Cincinnati, OH [3]Division of Trauma, University of Cincinnati Department of Surgery, Cincinnati, OH

**INTRODUCTION:** Chronic pain (CP) is a common development in trauma patients. Ketamine may reduce need for opioid therapy and subsequent transition to CP given its unique pharmacodynamic activity in pain signaling.

**RESEARCH QUESTION OR HYPOTHESIS:** Administration of continuous intravenous infusion (CIVI) ketamine for ≥12 hours in ICU patients with acute trauma will decrease incidence of CP development.

**STUDY DESIGN:** Retrospective, propensity score matched study at an academic medical and regional level I trauma center.

**METHODS:** Fifty-four patients (27 pairs) were propensity score matched based on sex, age, race, Injury Severity Score, and trauma mechanism. The primary endpoint was to determine if there was a difference in CP development, defined as pain requiring treatment with opioids at 3 months following hospital discharge, between patients receiving ketamine (KG) versus standard of care (SOC). Secondary endpoints analyzed differences in opioid requirements (represented as oral morphine equivalents [OME]) within the KG based on whether therapy was initiated within or after 72 hours of admission and the total amount of ketamine received, separated into quartiles.

**RESULTS:** Baseline characteristics were similar between groups except for weight and initial opioid requirements (KG, 659.6±386.6 vs SOC, 298±242.9 OME; $p<0.001$). There was no difference in CP development between groups (KG, 70.4% vs SOC, 55.6%; $p=0.398$). Opioid requirements between quartiles of total amount of ketamine administered were no different at hospital discharge, 1-month, or 3-month follow-up. Patients initiated on ketamine 72 hours after admission required less opioid therapy at 3-month follow-up than those exposed earlier (105 [22.5-172.5] vs 20 [0-52.5] OME; $p=0.029$). No differences were observed at hospital discharge or 1-month follow-up.

**CONCLUSION:** This exploratory analysis found no difference in development of CP after CIVI ketamine nor a relationship of time to therapy initiation or amount of ketamine received and opioid requirements. The relationship between delayed CIVI ketamine initiation and decreased opioid requirement at 3-month follow-up warrants further investigation.

**77. Getting code smart (sepsis medical alert response team): multidisciplinary interventions to improve sepsis bundle performance are**

**associated with decreased mortality** *Monica Shah, Pharm.D.*[1], Violet Kramer, MD[2], Victor Arcega, MD[3], Prateek Ghatage, MD[3], Daphne Villanueva, MD[3], Justina Girgis, Pharm.D. Candidate[4], Thomas Baker, IRB Research[5], A. Scott Mathis, Pharm.D.[1]; [1]Pharmacy, Monmouth Medical Center, Long Branch, NJ [2]Dept of Medicine, Pulmonary/Critical Care, Monmouth Medical Center, Long Branch, NJ [3]Dept of Medicine, Monmouth Medical Center, Long Branch, NJ [4]Ernest Mario School of Pharmacy at Rutgers University, Piscataway, NJ [5]Medical Education, Monmouth Medical Center, Long Branch, NJ

**INTRODUCTION:** The Surviving Sepsis Campaign (SSC) has published guidelines, including sepsis bundles of care. Since the SSC's first guidelines were released, sepsis mortality has decreased overall. Implementation of bundle elements remains low due to many barriers including recognition, staffing, and care organization.

**RESEARCH QUESTION OR HYPOTHESIS:** Implementation of multiple interventions to improve diagnosis and management of sepsis, and SSC bundles would yield improvement in bundle performance and sepsis mortality.

**STUDY DESIGN:** Retrospective review (before and after study)

**METHODS:** We evaluated 504 patients with sepsis from January-December 2015 (pre-intervention, n=121) and January-December 2017 (post-intervention, n=383). Sepsis care as a chart-abstracted core measure was implemented by January 2016. Interventions included use of the EHR-based St. John Sepsis Agent Alert to improve recognition, increased staff education, ongoing chart reviews with short-interval feedback, and engaging RRT nurses in delivery of sepsis bundles as part of a "Code SMART response". Data collection included adherence to the "3-hour" and "6-hour" SSC bundle elements: initial lactate level, blood cultures, timely administration of appropriate antibiotics and crystalloids, and follow-up assessment of volume status when indicated. In-hospital mortality among the two groups was evaluated. The two groups were compared using Chi-Square and Fisher's Exact Test.

**RESULTS:** Significant improvement was seen in the post-intervention compared to the pre-intervention group for adherence to bundle elements: initial lactate (97.1% vs. 89.2%, p <0.001), blood cultures (99.3% vs. 91.7%, p <0.001), delay in administration of broad-spectrum antibiotics (0.5% vs. 10.1%, p<0.001), inappropriate or no antibiotics (0.3% vs. 9.1%, p<0.001), administration of crystalloid fluids (98.1% vs. 69.4%, p<0.001), and focused exam (94.8% vs. 65.3%, p <0.001). In-hospital mortality was lower in the post-intervention compared to the pre-intervention group (16.5% vs. 24.1%, p=0.047).

**CONCLUSION:** Multiple interventions improved diagnosis and management of sepsis, bundle performance, and was associated with decreased sepsis mortality.

**78. Evaluation of prophylactic heparin dosage on the incidence of venous thromboembolism, bleeding, and thrombocytopenia in critically ill patients receiving mechanical ventilation** *Paul Reynolds, Pharm.D.*[1], Garth Wright, MPH[1], R. Brett McQueen, MA[2], Ellen Burnham, MD[3], Michael Ho, MD[4], Marc Moss, MD[3], Robert William Vandivier, MD[3], Tyree Kiser, Pharm.D.[1]; [1]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO [2]University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO [3]Pulmonary Sciences and Critical Care Medicine, University of Colorado School of Medicine, Aurora, CO [4]Division of Cardiology, University of Colorado School of Medicine, Aurora, CO

**INTRODUCTION:** Venous thromboembolism (VTE) occurs in 13 to 31% of critically-ill patients without prophylaxis. Although heparin lowers VTE incidence by 55%, VTE still occurs in 5-8% of these patients. Higher dosing has been proposed to lower incidence of VTE in these patients, but this remains unstudied.

**RESEARCH QUESTION OR HYPOTHESIS:** Heparin prophylaxis at a dose of 5000 units TID lowers the incidence of new VTE compared with BID dosing in critically-ill patients.

**STUDY DESIGN:** Retrospective cohort study utilizing a healthcare database including 40% of US hospitalizations.

**METHODS:** We included mechanically-ventilated patients for greater than 2 days without a primary or secondary admission diagnosis of VTE. Exclusion criteria were: switching heparin dosage, thrombolytics, orthopedics, trauma, or death before 2 days. The primary outcome was development VTE after day 2. Key secondary outcomes included major bleeding, thrombocytopenia, and mortality. The primary analysis was conducted with propensity-matching, adjusting for unbalanced covariates. Multivariable-analysis was conducted for VTE risk-factors.

**RESULTS:** A total of 28,891 patients from 374 hospitals were matched 1:1 by dose. Admission diagnoses included sepsis (22%), heart-failure (28%), COPD (31%), renal-failure (28%) and surgery (24%). VTE after day 2 occurred in 6.16% of patients treated with TID heparin (n=14,451) vs 6.23% with BID heparin (n=14,440), with no significant differences in pulmonary embolism (PE) or deep venous thrombosis (DVT). There were no differences in hospital mortality (15.76% vs 15.15%), major bleeding (0.2 vs 0.3%), thrombocytopenia (4.8% vs 7.22%), or heparin-induced-thrombocytopenia (0.43% vs 0.48%; P > 0.08 for all). Significant VTE risk-factors included sepsis, paralytics, thrombocytopenia, vasopressors, and surgery (P<0.05 for all). DVT and PE diagnosis increased length of stay by 7 and 15 days compared with patients who were not diagnosed with VTE, respectively (P<0.05). Diagnosis of PE significantly increased in-hospital mortality (27% vs 15.4%; P=0.001) compared with no VTE diagnosis.

**CONCLUSION:** In critically-ill patients, prophylactic dosing of heparin TID versus BID was not associated with differences in VTE or safety. Several modifiable VTE risk-factors were identified.

**79. Assessment of serum accumulation of inhaled tobramycin in patients treated for ventilator-associated pneumonia: a retrospective analysis** *Andrew Globke, Pharm.D.*[1], Christopher Droege, Pharm.D.[2], Neil Ernst, Pharm.D.[2], Paige Garber, Pharm.D.[2], Shaun Keegan, Pharm.D.[2], Betty Tsuei, MD[3], Jessica Winter, Pharm.D., BCPS[2], Madeline Foertsch, Pharm.D., BCPS[4], Nicole Harger, Pharm.D., BCPS[4], Eric Mueller, Pharm.D.[2]; [1]Williamson Medical Center, Franklin, TN [2]University of Cincinnati Medical Center, Cincinnati, OH [3]University of

Cincinnati, Cincinnati, OH [4]Department of Pharmacy, UC Health – University of Cincinnati Medical Center, Cincinnati, OH

**INTRODUCTION:** Inhaled tobramycin (INHt) for treatment of ventilator-associated pneumonia (VAP) is considered an alternative to intravenous (IV) delivery and thought to minimize risks of serum accumulation and subsequent nephrotoxicity. Little data exist evaluating incidence and risk factors for accumulation.

**RESEARCH QUESTION OR HYPOTHESIS:** INHt is associated with serum accumulation in critically ill, mechanically ventilated patients.

**STUDY DESIGN:** Single-center, retrospective, safety analysis of critically ill, mechanically ventilated patients on empiric INHt.

**METHODS:** Adult ICU patients receiving INHt 300 mg twice daily for VAP and no other concomitant aminoglycoside therapy were reviewed for detectable serum tobramycin concentrations obtained after the third dose. Patients were grouped by detectable (DC, >0.6 mcg/mL) or undetectable (UC) concentrations. Univariate and multivariate logistic regressions were performed for factors associated with detectable concentrations and acute kidney injury (AKI).

**RESULTS:** 59 patient encounters were included in the analysis: DC, 39 (66.1%); UC, 20 (33.9%). Differences between groups were age (DC, 56.7±11.4 v UC, 45.9±15.0 years, p=0.004) and serum creatinine (DC, 1.26 [0.84-2.18] v UC, 0.76 [0.47-1.28] mg/dL, p=0.004), rate of AKI/ESRD (DC, 19 [48.7%] v UC, 3 [15%]; p=0.02), and positive end-expiratory pressure (PEEP) (DC, 9.2 [7-11] v UC, 8.0 [5.6-8.9] cm $H_2O$, p=0.043) within 24 hours before INHt. Age >60 years (OR 7.34 [95% CI 1.20-44.7]) and PEEP >10 cm $H_2O$ at INHt initiation (OR 15.7 [95% CI 1.95-127.6]) were identified as independent risk factors. There was no difference in new AKI during therapy (DC, 4 [20%] v UC, 3 [17.6%]; p=1.0) between groups.

**CONCLUSION:** Detectable serum tobramycin concentrations were observed in the majority of critically ill patients receiving empiric INHt for VAP. Age >60 years and PEEP >10 cm $H_2O$ at INHt initiation were identified as independent risk factors. Dose reduction may be necessary in these patients to avoid potential harm.

**80. The effect of obesity on vancomycin serum concentrations in patients on continuous venovenous hemofiltration** *Vincent Soriano, Pharm.D.*[1], Kimberly Ackerbauer, Pharm.D.[2], Payal Gurnani, Pharm.D.[3]; [1]Cook County Health and Hospital System, Chicago, IL [2]Boston Medical Center, Boston, MA [3]Rush University Medical Center, Chicago, IL

**INTRODUCTION:** Vancomycin is a mainstay antibiotic for the treatment of gram-positive bacterial infections. Critical illness, obesity, and use of continuous venovenous hemofiltration (CVVH) significantly affect its clearance. Attainment of goal trough concentration has been associated with improved clinical outcomes. An optimal dosing regimen has not been established in the above patient population.

**RESEARCH QUESTION OR HYPOTHESIS:** Does the proportion of target vancomycin trough concentration attainment differ between critically ill, obese patients receiving CVVH compared with non-obese patients using a protocol guided dosing regimen?

**STUDY DESIGN:** This was a single-center, retrospective cohort study of adult patients requiring CVVH and vancomycin therapy admitted to Rush University Medical Center between January 1, 2013 and February 20, 2017.

**METHODS:** Patients were included if they were 18 years of age or older, received at least 48 hours of vancomycin therapy, adhered to our institutional vancomycin dosing protocol, and had a serum vancomycin trough concentration drawn prior to the third or fourth dose. The dosing regimen consisted of a 15-25 mg/kg loading dose using actual body weight followed by a maintenance dose of 15 mg/kg every 24 hours. The primary outcome was the proportion of patients attaining goal vancomycin trough concentration, defined as 15-20 mcg/ml. Obesity was defined as having a BMI ≥30 $kg/m^2$.

**RESULTS:** Fifteen patients were included for analysis. No significant difference in the rate of goal trough attainment was observed between non-obese and obese patients (6.7% vs 33%, respectively; p=0.287). A higher proportion of non-obese patients had subtherapeutic concentrations (20% vs 0%; p=0.044). The median vancomycin trough concentration in the non-obese and obese patients were 16.7 mcg/ml and 19.7 mcg/ml, respectively (p=0.181).

**CONCLUSION:** The institutional vancomycin dosing protocol achieved similar rates of goal trough attainment between the 2 groups. Given the small sample size and study limitations, further studies are required to validate these findings and to explore its potential clinical implications.

**81. Vasopressin dosing protocols may result in disparate use in obese patients** *Susan Smith, Pharm.D.*[1], Kelli Rumbaugh, Pharm.D.[2], Susan Hamblin, Pharm.D.[2]; [1]Department of Clinical and Administrative Pharmacy, University of Georgia College of Pharmacy, Athens, GA [2]Department of Pharmaceutical Services, Vanderbilt University Medical Center, Nashville, TN

**INTRODUCTION:** Due to the rising cost of vasopressin and the lack of confirmed mortality benefit, vasopressin dosing protocols are implemented to guide appropriate use, while decreasing utilization and cost.

**RESEARCH QUESTION OR HYPOTHESIS:** We sought to evaluate whether vasopressin dosing protocols affect vasopressin utilization in obese patients with septic shock. We hypothesized that dosing protocols would result in earlier initiation of vasopressin in obese patients.

**STUDY DESIGN:** Retrospective, observational cohort study conducted in a 20-bed surgical ICU (SICU) and a 14-bed trauma ICU (TICU).

**METHODS:** Vasopressin dosing protocols were implemented in the SICU in August 2015 and the TICU in February 2016. SICU Protocol: vasopressin initiated if norepinephrine >12 mcg/min for >1 hour. TICU Protocol: vasopressin initiated if norepinephrine >20 mcg/min for ≥2 hours. Adult non-obese (BMI <30) and obese (BMI ≥30) patients requiring vasopressin in the 12 months following protocol implementation were included. The primary outcome was time to vasopressin initiation. Secondary outcomes included weight-based

norepinephrine rate (mcg/kg/min) at the time of vasopressin initiation, vasopressin and norepinephrine duration, and mortality.

**RESULTS:** The SICU cohort included 70 non-obese and 47 obese patients, and the TICU cohort included 48 and 23 patients, respectively. The time to vasopressin initiation was shorter in obese patients (SICU: non-obese 11.8 vs obese 3.1 h, p=0.003; TICU: 8.0 vs 5.4 h, p=0.133). The norepinephrine rate at the time of vasopressin initiation was also lower in obese patients (SICU: non-obese 0.27 vs obese 0.15 mcg/kg/min, p=0.001; TICU: 0.27 vs 0.20 mcg/kg/min, p=0.043). The total duration of vasopressors and the incidence of hospital mortality were similar between groups.

**CONCLUSION:** Implementation of vasopressin dosing protocols resulted in earlier initiation of vasopressin in obese patients. This unintended effect has unknown clinical significance. Future research should confirm these findings in a larger population and examine the association between vasopressor utilization and the "obesity paradox" in septic shock.

**82. Rifaximin for the treatment of septic shock: targeting endotoxemia** Jane Lee, Pharm.D.[1], Stefanie LeGrand, Pharm.D. Candidate[2], Nithya Abraham, Pharm.D. Candidate[2], *Justin Kinney*, *Pharm.D.*, *M.A.*, *BCCCP*[3]; [1]School of Pharmacy, Loma Linda University, Loma Linda, CA [2]Loma Linda University, Loma Linda, CA [3]School of Pharmacy, Loma Linda University Health, Loma Linda, CA

**INTRODUCTION:** The presence of endotoxins has been linked in the pathogenesis of gram-negative sepsis and as a potential predictor of mortality. Rifaximin, an antibiotic normally used for traveler's diarrhea and hepatic encephalopathy, is associated with a reduction in endotoxemia; especially in patients with cirrhosis. However, limited evidence exists exploring the effect rifaximin may have in septic patients.

**RESEARCH QUESTION OR HYPOTHESIS:** Evaluate the outcomes of septic shock patients who received rifaximin, in addition to standard of care (SOC).

**STUDY DESIGN:** Retrospective, single health system, patient chart review at Loma Linda University Health admitted from 4/2015 to 7/2017

**METHODS:** Inclusion criteria were: adults with septic shock, patients who received rifaximin plus SOC versus SOC. Pregnant patients were excluded. 701 patients were initially identified and screened, resulting in 60 and 80 patients for the rifaximin and control groups respectively. The primary outcomes were ICU and in-hospital survival while the secondary outcomes were: ICU and hospital length of stays, total duration of vasopressor therapy, and number of vasopressors. Lastly, we wanted to compare the same outcomes in patients with cirrhosis. Statistical analyses were conducted with SPSS, version 23.

**RESULTS:** There was no difference in ICU or hospital survivals. The rifaximin group had longer lengths of stay in both the ICU (14.5 vs. 6.9 days; p<0.001) and hospital (29 vs. 10.5 days; p<0.001) as well as a longer duration of vasopressor therapy (9.5 vs. 3.7 days; p<0.001). In patients with cirrhosis, the rifaximin arm had improved ICU survival (50% vs. 27%; p=0.04) compared to control, but longer ICU stay (14.9 vs. 7.3 days; p=0.02), hospital stay (28.6 vs. 10.9; p=0.02), and duration of vasopressors (8.9 vs. 4.4; p=0.02).

**CONCLUSION:** The addition of rifaximin to the standard of care for septic shock did not demonstrate any benefit in either ICU or hospital survival. However, patients with cirrhosis showed improved ICU survival with rifaximin use.

**83. Evaluation of dexmedetomidine for alcohol withdrawal syndrome with concomitant benzodiazepine treatment on length of stay** *David Quach*, *Pharm.D.*, *MPH*[1], Megan Musselman, Pharm.D., MS, BCPS, BCCCP[1], Jessica Casey, Pharm.D., BCPS[1], Matt Baker, Pharm.D., BCPS, DPLA[1], Jeremy John, Pharm.D., BCPS[1], Todd Hill, DO[2]; [1]North Kansas City Hospital, North Kansas City, MO [2]Meritas Health Psychiatry, Kansas City, MO

**INTRODUCTION:** Dexmedetomidine has gained popularity as adjunctive therapy for alcohol withdrawal syndrome-associated agitation and autonomic hyperreactivity. Previous studies have identified the benzodiazepine-sparing effects of dexmedetomidine in alcohol withdrawal syndrome; however, limited evidence is available regarding its impact on overall length of stay.

**RESEARCH QUESTION OR HYPOTHESIS:** Does adjunctive dexmedetomidine therapy with concomitant benzodiazepines for alcohol withdrawal syndrome (AWS) affect intensive-care unit (ICU) and total hospital length of stay?

**STUDY DESIGN:** Single-center, retrospective chart review.

**METHODS:** Adult ICU patients admitted with an ICD-10 code for AWS who were ordered benzodiazepines from October 2015 through September 2017 were evaluated. The primary endpoint of the study was ICU and total hospital length of stay. The secondary endpoints included length of dexmedetomidine therapy, mortality, delirium and agitation rates, hemodynamic instability, respiratory depression rates, and mechanical ventilation status.

**RESULTS:** There were 107 patients reviewed with 56 patients meeting inclusion criteria. The ICU length of stay was higher in the dexmedetomidine group (152.7 hours vs. 58.6 hours; p=<0.01) as was the total hospital length of stay (289.2 hours vs. 166.4 hours; p<0.01). The mechanical ventilation rate was significantly higher in the dexmedetomidine group compared to the benzodiazepine group (44.8% vs. 7.4%; p <0.01), and the dexmedetomidine group had a longer average duration of mechanical ventilation (2.4 days vs. 0.4 days; p<0.01). In addition, the dexmedetomidine group had significantly higher delirium and agitation rates (p<0.01) when compared to the benzodiazepine group.

**CONCLUSION:** Adjunctive dexmedetomidine was found to prolong ICU and total hospital length of stay in patients admitted with AWS. It is worthy to note that the study was a retrospective review with the potential limitations of patient characteristic differences that play an unknown role in patient severity between the two groups. Further research is needed to evaluate clinically significant outcomes pertaining to the safety and efficacy of dexmedetomidine as an adjunctive treatment in this patient population.

**84. Evaluation of choice of second therapy phase anti-epileptic drug and resolution of status epilepticus** Yasmine Zeid, Pharm.D.[1], *Erin K. Hennessey, Pharm.D., BCPS*[1], Matthew J. Korobey, Pharm.D., BCCCP[2]; [1]St. Louis College of Pharmacy/Mercy Hospital St. Louis, St. Louis, MO [2]Mercy Hospital St. Louis, St. Louis, MO

**INTRODUCTION:** The treatment algorithm for status epilepticus (SE) recommends levetiracetam, valproic acid, or fosphenytoin as second therapy phase treatment. At this time there is no clear evidence that any one agent results in better outcomes. Since duration of status epilepticus is one of the strongest predictors of morbidity and mortality, the ability to achieve resolution of status epilepticus rapidly is imperative.

**RESEARCH QUESTION OR HYPOTHESIS:** Is there a difference in incidence of SE resolution when using levetiracetam vs. fosphenytoin as the second therapy phase agent?

**STUDY DESIGN:** Single-center, retrospective cohort.

**METHODS:** Patients ≥ 18 years old admitted from January 2013 to October 2017 who received one dose of levetiracetam or fosphenytoin at Mercy Hospital St. Louis following benzodiazepine treatment for SE were included. The primary outcome was the incidence of SE resolution after one dose of levetiracetam or fosphenytoin. Secondary outcomes included mortality during hospital admission, hospital length of stay (LOS), 30-day readmission for SE, and dose appropriateness. Chi-square was used to evaluate categorical data and student's t-test was used to evaluate continuous data.

**RESULTS:** One-hundred twelve patients were included; 72 in the levetiracetam group and 40 in the fosphenytoin group. Incidence of SE resolution was similar between groups (68.1% vs. 72.5%; p=0.62). Mortality during admission, hospital LOS, and 30-day readmission for SE did not differ between groups. The incidence of dose appropriateness was significantly higher in the levetiracetam group (83% vs. 65%; p=0.03). The most commonly used benzodiazepine was lorazepam, with similar average dosing between groups (2.2 vs. 2.3 mg; p=0.34).

**CONCLUSION:** SE resolution was not associated with choice of second therapy phase agent. Larger, prospective studies are needed to better evaluate differences in patient outcomes. The dosing of second therapy phase agents for SE at this institution can be further optimized to ensure appropriate treatment.

**85. Evaluation of infectious complications between PPI and $H_2$RA therapy in post-CABG patients** *Jordan Johnson, Pharm.D.*, Dylan Wilson, Pharm.D., BCPS; Department of Pharmacy, Jackson-Madison County General Hospital, Jackson, TN

**INTRODUCTION:** Stress ulcer prophylaxis (SUP) is commonly used following cardiovascular surgical procedures. Proton pump inhibitors (PPI) are often favored over histamine-2 receptor antagonists ($H_2$RA) due to a perceived efficacy benefit, but PPIs have been associated with development of pneumonia and *Clostridium difficile* (*C. difficile*) and potentially decreasing the efficacy of clopidogrel. The optimal agent for SUP in postoperative CABG patients has not been adequately studied.

**RESEARCH QUESTION OR HYPOTHESIS:** Are post-CABG patients who receive a PPI for SUP at increased risk of pneumonia or *C. difficile* compared to patients who receive a $H_2$RA?

**STUDY DESIGN:** This is a single-center, retrospective, observational cohort study in post-CABG patients.

**METHODS:** Data points were obtained from the Society of Cardiothoracic Surgeons (STS) database. Patients were retrospectively identified and included if age 18 years or older and underwent CABG surgery one year before and one year after our institution's ordersets were changed from using primarily an H2RA to a PPI for SUP. Patients were excluded if they received both a PPI and $H_2$RA after surgery and if they underwent valvular procedures in addition to CABG. The primary outcome was rates of post-op pneumonia and *C. difficile*. Secondary endpoints included gastrointestinal bleeds, myocardial infarction, stroke, and 30-day mortality.

**RESULTS:** A total of 707 patients were screened and 646 patients were included. Eleven patients (2.66%) in the PPI group and six patients (2.59%) in the $H_2$RA group developed pneumonia (p=0.964). One patient in each group was diagnosed with *C. difficile* infection (p>.999). 4.83% of patients in the PPI group had cardiac arrest, compared to 1.29% in the $H_2$RA group (p=0.025). There was no statistically significant difference between rates of stroke, GIB, or 30-day mortality.

**CONCLUSION:** Use of PPIs for SUP compared to $H_2$RAs did not increase the risk of pneumonia and *C. difficile* infections in post-CABG patients.

**86. Midodrine for the treatment of septic shock: a possible bridge off vasopressors** Sharon Jung, BS[1], Vanessa Tran, BS, MS[1], *Justin Kinney, Pharm.D., M.A., BCCCP*[2]; [1]School of Pharmacy, Loma Linda University, Loma Linda, CA [2]School of Pharmacy, Loma Linda University Health, Loma Linda, CA

**INTRODUCTION:** Septic shock is a life-threatening condition from an infection causing hypotension, poor tissue perfusion, cellular metabolism abnormalities, and higher mortality. Patients with septic shock often have prolonged ICU stays due to persistent hypotension requiring treatment with IV vasopressors. Midodrine is an oral $\alpha_1$ agonist that causes an increase in blood pressure, typically used for orthostatic or hemodialysis-induced hypotension. A recent retrospective study identified midodrine could potentially wean vasopressors off sooner and shorten ICU stays in septic shock patients.

**RESEARCH QUESTION OR HYPOTHESIS:** Evaluate the influence of midodrine to wean off vasopressors in septic shock patients.

**STUDY DESIGN:** Retrospective, single health system, patient chart review at Loma Linda University Health (LLUH) between 2013 and 2017.

**METHODS:** Only adult patients with septic shock were included. Patients were excluded if midodrine was discontinued before vasopressors. The primary outcomes were ICU length of stay (LoS), hospital LoS, and vasopressor duration. Secondary outcomes were: ICU and hospital survival rates, and to review the drug utilization (midodrine) at LLUH. Statistical analyses were conducted with SPSS, version 23.

**RESULTS:** 110 patients were included (312 total patients screened); 60 patients received midodrine plus vasopressor therapy compared to 50 patients who received vasopressor therapy alone. Patients receiving midodrine had longer ICU LoS (16.7 vs. 6.2 days; p< 0.001), hospital LoS (24.5 vs. 10.4 days; p< 0.001), and duration of vasopressor therapy (7.1 vs. 3.2 days; p<0.001). There was no difference in ICU survival (67.8% vs. 56%; p=0.247), but the midodrine group did have improved hospital survival (67.8% vs. 46%; p=0.022). The median initial and max doses of midodrine were 15 mg/day and 30 mg/day, respectively.

**CONCLUSION:** The use of midodrine to wean off vasopressors in septic shock patients did not reduce the ICU LoS, hospital LoS, or duration of vasopressor therapy. However, the patients who received midodrine had improved ICU mortality.

**87. Perceptions of pharmacists regarding the cost containment strategies and proper use of vasopressin in septic shock** *Drayton Hammond, Pharm.D., MBA, BCPS, BCCCP*[1], Megan A. Rech, Pharm.D., MS, BCPS, BCCCP[2], Mitchell Daley, Pharm.D.[3], John Devlin, Pharm.D.[4], Kirstin Kooda, Pharm.D., BCPS, BCCCP[5], Ishaq Lat, Pharm.D.[6], Heather A. Personett, Pharm.D.[7], Russell Roberts, Pharm.D.[8], Gretchen Sacha, Pharm.D.[9], Joanna Stollings, Pharm.D.[10], Joseph Swanson, Pharm.D.[11], Seth Bauer, Pharm.D., FCCM, BCPS[12]; [1]Department of Pharmacy, Rush University Medical Center, Chicago, IL [2]Department of Pharmacy, Loyola University Medical Center, Maywood, IL [3]Ascension, Austin, TX [4]Northeastern University, Boston, MA [5]Department of Pharmacy Services, Mayo Clinic Hospital – Rochester, Rochester, MN [6]Shirley Ryan Lab, Chicago, IL [7]Mayo Clinic, Rochester, MN [8]Massachusetts General Hospital, Boston, MA [9]Cleveland Clinic, Cleveland, OH [10]Department of Pharmaceutical Services, Vanderbilt University Medical Center, Nashville, TN [11]College of Pharmacy, University of Tennessee Health Science Center, Memphis, TN [12]Department of Pharmacy, Cleveland Clinic, Cleveland, OH

**INTRODUCTION:** Vasopressin is a recommended adjunctive agent to norepinephrine in patients with septic shock. The cost of vasopressin continues to rise, which may affect opinions and institutional initiatives.

**RESEARCH QUESTION OR HYPOTHESIS:** Pharmacists' opinions regarding appropriate vasopressin use are different when vasopressin cost is considered.

**STUDY DESIGN:** An electronic survey of pharmacists in intensive care units and emergency departments was conducted.

**METHODS:** The survey was developed, validated for content and construct validity, and emailed in August/September 2017 using Qualtrics. A 4-point Likert scale was used for opinion-based questions (1=very likely, 4=very unlikely). Responses between groups who did and did not implement education/initiatives were compared using chi-square or Fisher-exact tests. MeNemar's test was used to compare vasopressin use with and without cost considerations. STATA v.12 was used.

**RESULTS:** Of 200 respondents, 56 (28%) had not implemented any initiatives/education regarding vasopressin rebranding and/or price increase. Forty-nine percent of the education/initiatives group implemented policies related to use for evidence-based indications/dosages. When vasopressin cost and evidence were considered, respondents less frequently recommended vasopressin as initial combination with norepinephrine (21% vs. 26.6%, p=0.031), second-line vasopressor to raise MAP preferential to epinephrine (65.2% vs. 72.3%, p=0.012), or reduce norepinephrine dosage (71.4% vs. 81.4%, p<0.001), and renal failure (26.1% vs. 32.2%, p=0.006) and more frequently recommended vasopressin when stress dose steroids were used (62.4% vs. 28.3%, p<0.001). At institutions that implemented an initiative, more respondents indicated vasopressin was initiated at 0.03 units/minute and not titrated to an effect (33.9% vs. 47.9%, p=0.045) and fewer respondents initiated vasopressin when norepinephrine dosage was ≤30 mcg/minute (64.3% vs. 46.5%, p=0.078).

**CONCLUSION:** Greater than three-quarters of institutions implemented at least one initiative/education regarding vasopressin rebranding/price increase. When vasopressin cost was considered, pharmacists recommended its use less frequently in multiple clinical scenarios that are grey areas.

**88. Evaluation of a "neuro-stim bundle" in traumatic brain injuries admitted to a level 1 trauma intensive care unit: the awake study** *Ruben Villanueva, Pharm.D.*[1], David Luu, MD[2], Brittany Karfonta, BSN[3], Bradley Bohnstedt, MD[4]; [1]Department of Pharmacy: Clinical and Administrative Sciences, The University of Oklahoma HSC College of Pharmacy, Oklahoma City, OK [2]Department of Anesthesia, The University of Oklahoma HSC College of Medicine, Oklahoma City, OK [3]Oklahoma Medical Research Foundation, Oklahoma City, OK [4]Department of Neurosurgery, The University of Oklahoma HSC College of Medicine, Oklahoma City, OK

**INTRODUCTION:** Amantadine has the most robust data for improving awakening/cognition in patients after a severe traumatic brain injury (TBI), although several pharmacological agents have been investigated. A "neuro-stim bundle" (NSB) including amantadine was developed at OU Medical Center.

**RESEARCH QUESTION OR HYPOTHESIS:** Early administration of a NSB will increase the rate of improvement in the Glasgow Coma Scale (GCS) over the initial week of treatment.

**STUDY DESIGN:** Single-center retrospective chart review.

**METHODS:** The NSB includes amantadine, sertraline, gabapentin, and trazadone. General criteria for use included GCS <12 after all sedative drips discontinued and no invasive ICP monitor. Exclusion criteria included less than three days of amantadine, GCS ≥13 on the day sedation stopped, or died within seven days of admission. Primary outcome is the difference in GCS between the NSB and control group. GCS was documented on days 1, 3, 5, and 7 after sedative drips discontinued, and discharge. $\chi^2$ and t-tests were used to compare categorical and continuous data, respectively.

**RESULTS:** At baseline there was no significant difference in mean age (42 years vs. 44 years); the NSB group had lower mean ED (5.35 vs. 7.27, p<0.05) and ICU GCS (6.19 vs. 7.90, p<0.05) in addition to higher mean ISS (30.28 vs. 25.87, p<0.05). The control group had

significantly higher GCS scores (p <0.05 for all comparisons): D1 (8.62 vs. 12.91), D3 (9.2 vs. 12.52), D5 (9.45 vs. 12.97), D7 (10.14 vs. 12.96), discharge (11.89 vs. 3.25). MANOVA did not identify a significant interaction of the NSB on GCS, although time was significant. Multiple regression identified ICU admit GCS to be predictive of the GCS on days 3, 5, 7, and discharge.

**CONCLUSION:** Although no significant improvement in GCS noted, dissimilar groups preclude firm conclusions. A prospective study is warranted to determine optimal timing and whether a combination is superior to amantadine alone.

**89. Therapeutic drug monitoring of amikacin and augmented renal clearance in critically ill pediatric patients** *Leslie Escobar, Pharm.D., Ph. D.*[1], Constanza Rivera, Pharm.D.[2], Daniela Poblete, Pharm.D.[3], Roxana Santana, Pharm.D.[4], Claudio Gonzalez, Pharm.D.[4]; [1]Department of Pediatrics and Infant Surgery, University of Chile, Santiago, Chile [2]Clínica Las Condes, Santiago of Chile, Chile [3]Universidad de Chile, Santiago of Chile, Chile [4]Hospital Exequiel Gonzalez Cortes, Santiago of Chile, Chile

**INTRODUCTION:** It is well known that critically ill pediatric patients have physio-pathological changes that modify pharmacokinetics (PK), mainly in distribution and elimination of hydrophilic drugs such as amikacin. Augmented renal clearance (ARC) has been slightly described. Therapeutic drug monitoring (TDM) of amikacin using one level (normally trough) does not provide enough information about the impact of ARC on amikacin plasma concentrations.

**RESEARCH QUESTION OR HYPOTHESIS:** Can we observe ARC and its impact on amikacin plasma concentrations in critically ill pediatric patients with a different timing for TDM?

**STUDY DESIGN:** Prospective (Jan 2016-Oct 2017) and descriptive pharmacokinetic study of amikacin based on peak and a proposed C6 (1 and 6h post 0.5h infusion, respectively) collected from critically ill patients at Exequiel Gonzalez Cortes Children Hospital, who received amikacin according to local antimicrobial programs. Neonates and patients in any renal replacement therapy were excluded.

**METHODS:** Only the first TDM of each patient was considered. For PK parameters, lineal regression and Bayesian analysis by PrecisePK software were performed. Schwartz formula was used to estimate clearance of creatinine (Clcrea) and to classify patients in ARC group if Clcrea>=160ml/min/1.73m$^2$. GraphPad Prism 7.02 was used for statistical analysis. Median[25-75%percentile] was used.

**RESULTS:** Eighty children and 80 TDM were included. Median peak and C6 amikacin concentration were 22.9 mg/L [17.6-27.8] and 4.5 mg/L [3-6.2], respectively. Fifty-six percent of patients had ARC with a significant higher Clcrea (226 vs 114 ml/min/1.73m$^2$; p<0.0001). Also, they obtained significant lower amikacin plasma levels compared with patients with no ARC (Cpeak: 21 vs 26.3 mg/L; p=0.0033 and C6: 3.3 vs 5.7 mg/L; p=0.0008), shorter half-lives (1.7 vs 2.1h; p=0.0023) and lower AUC (88 vs 121mg*L/h; p=0.0002).

**CONCLUSION:** ARC is frequent, leading with no effective concentration at least the half of the day. A C6 sampling could be more appropriate than trough level to observe ARC for dose adjustment in these patients. (Fondecyt n°11150935)

**90. Physical compatibility of various anti-infective medications with balanced fluid solutions** *Alyson G. Wilder, Pharm.D., BCPS*[1], Jaime A. Foushee, Pharm.D., BCPS, BCCCP[1], Megan A. Greer, Pharm.D. Candidate[2], Adrienne M. Wright, Pharm.D. Candidate[2], Laura M. Fox, Ph. D.[3]; [1]Department of Pharmacy Practice, Presbyterian College School of Pharmacy, Clinton, SC [2]Presbyterian College School of Pharmacy, Clinton, SC [3]Department of Pharmaceutical and Administrative Sciences, Presbyterian College School of Pharmacy, Clinton, SC

**INTRODUCTION:** Multiple intravenous (IV) medications are often required for critically ill patients where limited venous access may necessitate co-administration of medications through the same catheter lumen. Recent data suggest balanced fluid solutions are associated with decreased patient morbidity, including acute kidney injury, when used for resuscitation of patients with sepsis and septic shock compared to normal saline. Additionally, the use of anti-infective agents is crucial for adequate treatment of a septic patient. Compatibility data are currently lacking for these newer balanced fluid solutions with many IV anti-infective medications. A minimum of physical compatibility should be assessed prior to co-infusing medications through a y-site connector.

**RESEARCH QUESTION OR HYPOTHESIS:** Are selected anti-infective medications compatible when co-infused through a y-site connector with Plasma-Lyte A and Lactated Ringers?

**STUDY DESIGN:** Quantitative; in vitro experiment

**METHODS:** Anti-infective study medications, including acyclovir, ampicillin, aztreonam, cefepime, ceftriaxone, ciprofloxacin, gentamicin, levofloxacin, meropenem, piperacillin-tazobactam, tobramycin, and vancomycin, were assessed for compatibility with Plasma-Lyte A and/or Lactated Ringers. Study solutions were tested at highest concentrations utilized in clinical practice. Physical compatibility was checked using visual assessment against both light and dark backgrounds and non-visible changes in turbidity were assessed using a laboratory turbidimeter. Assessments were made at time of mixing and every 15 minutes thereafter for one hour to simulate contact time in a y-site. A turbidity difference of ≥ 0.5 NTU was considered incompatible.

**RESULTS:** Acyclovir, ampicillin, aztreonam, cefepime, ceftriaxone, ciprofloxacin, gentamicin, levofloxacin, meropenem, piperacillin-tazobactam, tobramycin, and vancomycin exhibited no visual or turbidimetric evidence of incompatibility when combined with Plasma-Lyte A over the study period. Additionally, ampicillin, cefepime and levofloxacin exhibited no visual or turbidimetric evidence of incompatibility when combined with Lactated Ringers over the study period.

**CONCLUSION:** All studied combinations exhibited physical compatibility, meeting the minimum requirement to safely co-administer these IV medications through a y-site connector.

**91. Impact of renal function on achieving therapeutic exenatide concentrations in acute brain injury: an exploratory dosing study** *Kathryn*

*Morbitzer, Pharm.D., MS*[1], Nicole R. Pinelli, Pharm.D., MS[2], J. Dedrick Jordan, MD, Ph.D.[3], Luigi Troiani, PA, MHS[4], Kelly Dehne, Pharm.D.[5], Casey Olm-Shipman, MD, MS[6], Emily Durr, Pharm.D.[7], Denise Rhoney, Pharm.D.[1]; [1]Division of Practice Advancement and Clinical Education, UNC Eshelman School of Pharmacy, Chapel Hill, NC [2]UNC Eshelman School of Pharmacy, University of North Carolina at Chapel Hill, Chapel Hill, NC [3]Department of Neurology and Neurosurgery, University of North Carolina at Chapel Hill School of Medicine, Chapel Hill, NC [4]University of North Carolina School of Medicine, Chapel Hill, NC [5]University of North Carolina Hospitals, Chapel Hill, NC [6]UNC School of Medicine, Chapel Hill, NC [7]Grady Health System, Atlanta, GA

**INTRODUCTION:** Hyperglycemia and glycemic variability (GV) are associated with poor outcomes in critically ill patients. Exenatide is predominantly renally eliminated and approved to improve glycemic control in type 2 diabetes mellitus (T2DM); however, evidence in critically ill patients with acute brain injury (ABI) is limited, particularly in those experiencing augmented renal clearance (ARC). This may impact the ability to achieve therapeutic exenatide concentrations ($C_{exenatide}$) [200-300pg/mL].

**RESEARCH QUESTION OR HYPOTHESIS:** Patients with ARC will exhibit subtherapeutic $C_{exenatide}$ resulting in reduced glycemic control.

**STUDY DESIGN:** Prospective, open-label exploratory dosing study

**METHODS:** Adult patients with ABI and two blood glucose (BG) concentrations>150mg/dL and<=300mg/dL were included. Intravenous exenatide infusion (50ng/min for 30min then 25ng/min) was administered within 48h of admission and continued for 48h. $C_{exenatide}$ were obtained at baseline, 12, 24, 36, and 48h, and 8h urine collection for measured creatinine clearance (mCrCl) was performed daily for 48h. ARC defined as 8h mCrCl[3]130mL/min/1.73m$^2$. Capillary BG measurements were obtained hourly during infusion. Primary endpoint was correlation of $C_{exenatide}$ with mCrCl. Secondary endpoints compared $C_{exenatide}$, median BG, and GV for ARC patients compared to non-ARC. Data presented as medians[IQR] or percentages. Primary endpoint used Spearman's correlation between mCrCl and $C_{exenatide}$ with $p<0.05$ considered statistically significant. Descriptive statistics performed for secondary endpoints. Analyses performed using STATA-v.15.1.

**RESULTS:** Seven patients completed study protocol (age 65.0yrs [61.5-69.5], 85.7% male, 42.8% T2DM history). Median mCrCl was 111.0mL/min/1.73m$^2$[66.3-131.3]. Four patients experienced ARC. Median $C_{exenatide}$ and BG were 211pg/mL[107.5-306.0] and 137.0mg/dL[116.3-163.4]. No correlation was found between $C_{exenatide}$ and mCrCl($r=-0.2, p=0.2$). The comparison of $C_{exenatide}$, BG, and GV is below:

| Variable(median[IQR]) | ARC(n=4) | Non-ARC(n=3) |
|---|---|---|
| $C_{exenatide}$(pg/mL) | 198.0[98.0-243.5] | 332.0[153.0-409.5] |
| BG(mg/dL) | 137.0[122.3-155.0] | 140.3[116.0-167.8] |
| GV(mg/dL) | 14.3[10.9-18.0] | 24.1[18.5-29.5] |

**CONCLUSION:** Continuous infusion dosing protocol achieved therapeutic $C_{exenatide}$ independent of mCrCl and presence of ARC in this exploratory study. Exenatide infusion using this dosing strategy may be a potential option for glycemic control in the setting of ARC but requires further validation.

**92. Prevalence and risk factors of inappropriate dosing of pharmacologic thromboprophylaxis during critical illness** *Tia Stitt, Pharm.D. Candidate*[1], W. Anthony Hawkins, Pharm.D., BCCCP[2], Ronald Hall II, Pharm.D., MSCS[3]; [1]University of Georgia College of Pharmacy, Albany, GA [2]Department of Clinical and Administrative Pharmacy, University of Georgia College of Pharmacy, Albany, GA [3]Texas Tech Health Sciences Center, Dallas, TX

**INTRODUCTION:** Prevention of venous thromboembolism during critical illness is standard of care. Extremes of body weight are associated with bleeding or treatment failure in patients receiving pharmacologic thromboprophylaxis (PTP). Consensus for dosing in extremes of body weight are lacking and evidence is diverse due to variability in anthropometric stratification.

**RESEARCH QUESTION OR HYPOTHESIS:** PTP is commonly inappropriately dosed in under and overweight critically ill adults.

**STUDY DESIGN:** A post-hoc analysis of a nested cohort from a previous cross–sectional study of critically ill adults across nine institutions.

**METHODS:** Patients receiving PTP with enoxaparin (ENOX) or unfractionated heparin (UFH) were included. The primary outcome was the prevalence of inappropriate dosing based on body mass index (BMI) and total body weight (TBW). A secondary outcome was to identify risk factors for inappropriate dosing. Multivariable generalized linear mixed-effect models were constructed to determine independent risk factors for inappropriate dosing of PTP. Table 1. Definitions of Appropriate Dosing

| Anthropometric stratification | ENOX Total Daily Dose (mg) | UFH Total Daily Dose (units) |
|---|---|---|
| BMI (kg/m$^2$) | | |
| <18.5 | 30 | 10000 |
| 18.5-24.99 | 40 | 15000 |
| 25-34.99 | ≥60 | ≥22500 |
| ≥35 | ≥80 | ≥22500 |
| TBW (kg) | | |
| <50 | 30 | 10000 |
| 50-99.9 | 40 | 15000 |
| 100-149.9 | ≥60 | ≥22500 |
| ≥150 | ≥80 | ≥22500 |

**RESULTS:** The nested cohort included 172 patients (ENOX=46, UFH=126). Inappropriate dosing was observed in 118 patients (68.6%) based on BMI and 74 (43%) per TBW. Independent risk factors for inappropriate dosing per BMI were receipt of UFH (OR 6.93, 95% CI 1.06-8.77) or a BMI underweight or overweight/obese (OR

10.45, 95% CI 4.38-24.92). Receiving UFH (OR 3.02, 95% CI 1.05-8.70) or a TBW <50kg or >100kg (OR 5.7, 95% CI 2.46-13.16) were independently associated with inappropriate dosing based on TBW.

**CONCLUSION:** Inappropriate dosing of pharmacologic thromboprophylaxis occurs frequently in critically ill adults, especially in body size extremes or when UFH is used.

**93. Bivalirudin versus heparin for anticoagulation in a percutaneous ventricular assist device** *Patrick Reed, Pharm.D.*, William Cahoon Jr., Pharm.D.; Department of Pharmacy Services, Virginia Commonwealth University Health System, Richmond, VA

**INTRODUCTION:** The manufacturer of the Impella percutaneous ventricular assist device (VAD) recommends patients be systemically anticoagulated with heparin, and for heparin to be infused through the device via a purge solution to prevent pump thrombosis. This would not be an appropriate choice of therapy for patients with heparin-induced thrombocytopenia. There are minimal reports of alternative anticoagulants in the Impella VAD.

**RESEARCH QUESTION OR HYPOTHESIS:** To evaluate the effectiveness of bivalirudin versus heparin in patients with an Impella VAD.

**STUDY DESIGN:** Single center, retrospective medical chart review.

**METHODS:** Patients with an Impella VAD who were anticoagulated with either bivalirudin or heparin were included. The primary endpoint was a comparison of the time in therapeutic aPTT range between the bivalirudin and heparin groups. Secondary endpoints included time to first therapeutic aPTT, number of supratherapeutic and subtherapeutic aPTTs, number of aPTT variations >20%, bleeding complications, and thrombosis complications. Additional information was collected to characterize the use of bivalirudin in an Impella VAD.

**RESULTS:** A total of 31 patients (15 in the bivalirudin group and 16 in the heparin group) met criteria for inclusion. The percentage of time in therapeutic aPTT range was higher in the bivalirudin group (59.5% vs. 47.1%, p<0.0001). No difference was identified between groups for time to first therapeutic aPTT (13.8 hours vs. 16.7 hours, p=0.6224). Heparin patients experienced a significantly higher number of subtherapeutic aPTTs and aPTT variation >20%, but no difference was found for number of supratherapeutic aPTTs between groups. There was a higher rate of thrombotic complications in the bivalirudin group (40% vs. 6.3%, p=0.0373), but no difference in bleeding complications was recognized.

**CONCLUSION:** Bivalirudin was associated with improved time in therapeutic aPTT range, fewer subtherapeutic aPTT values, and less variation over 20% from previous aPTT value than patients receiving heparin. However, bivalirudin patients were more likely to experience thrombotic complications related to the Impella VAD.

**94. Impact of a spontaneous awakening trial and spontaneous breathing trial protocol implementation on the amount and duration of sedation and analgesia in the critically ill** *Lesly Jurado, Pharm.D.*[1], Stephanie Price, Pharm.D.[2], Lisa Hall Zimmerman, Pharm.D.[2], Marcus Ferguson, RT[2], Kevin O'Neil, MD[2], Elizabeth Acquista, MD[2]; [1]Pharmacy Department, New Hanover Regional Medical Center, Wilmington, NC [2]New Hanover Regional Medical Center, Wilmington, NC

**INTRODUCTION:** Daily spontaneous awakening trials (SAT), may decrease the occurrence of oversedation. When performed with spontaneous breathing trials (SBT), SATs lead to extubation quicker after passing an SBT. Paired SAT/SBT protocols lead to less ventilator days, decreased ICU LOS, however the effect of a paired SAT/SBT on sedation and analgesia is not well defined.

**RESEARCH QUESTION OR HYPOTHESIS:** To compare the amount and duration of sedation and analgesia in mechanically ventilated patients who underwent separate versus concomitant SAT/SBTs.

**STUDY DESIGN:** Retrospective cohort

**METHODS:** Adult mechanically ventilated patients in STICU and MICU before/after implementation of a paired SAT/SBT protocol were included. Patients were excluded if they expired, were on comfort measures, or had profound neurological deficits. Data were collected from November – December 2016 for the pre-cohort and from February – March 2017 for the post-cohort.

**RESULTS:** Of the 201 patients admitted to STICU/MICU during the study period, 135 patients met inclusion. There was no significant difference in demographics between cohorts. The average daily dose of propofol was significantly reduced in the post-pilot cohort (15.6±9.5 mcg/kg/min per day vs. 11.3±8.4mcg/kg/min per day, p=0.01). The average fentanyl dose in the pre-pilot cohort was 32.5±43.3 mcg/hr compared to 48.2±45.2 mcg/hr for the post-pilot cohort (p=0.06). There was no significant reduction in the duration of propofol or fentanyl. There was a significant reduction in median RASS score in the post-pilot cohort (-1.5 vs. -1, p=0.005).

**CONCLUSION:** Implementation of a concomitant SAT/SBT protocol can decrease daily dose of propofol used throughout a patient's intubation period. Our study did not find a reduction in duration of propofol or fentanyl. While there was not a statistically significant difference in fentanyl doses between the two cohorts, there was a trend towards higher fentanyl doses for the post-cohort. Paired SAT/SBT protocols should be utilized in order to decrease the amount of propofol used in mechanically ventilated patients.

**95. Incident ICU delirium, its duration, & coma/delirium days: association with 28- and 90-day mortality** *Matthew Duprey, Pharm.D.*[1], Mark van den Boogaard, RN, Ph.D.[2], Hans van der Hoeven, MD Ph. D.[2], Peter Pickkers, MD Ph.D.[2], John Devlin, Pharm.D.[3]; [1]School of Pharmacy, Northeastern University, Boston, MA [2]Radboud University Medical Center, Nijmegen, Netherlands [3]Northeastern University School of Pharmacy, Boston, MA

**INTRODUCTION:** Delirium prevalence and/or its duration is associated with greater 30-day, 6-month and 1-year mortality. However, the association between ICU incident delirium and mortality remains unclear.

**RESEARCH QUESTION OR HYPOTHESIS:** To measure the association between incident ICU delirium, its duration, days with coma and/or delirium in the 28 days after ICU admission and 28- and 90-day mortality

**STUDY DESIGN:** Retrospective evaluation of a randomized, delirium prevention trial

**METHODS:** This IRB-approved, post-hoc analysis evaluated delirium-free adults for delirium and coma 3/day for up to 28 days, and measured mortality at 28 and 90 days (delirium day: ≥1 positive CAM-ICU or ICDSC; coma day: no delirium + ≥ 1 RASS score ≤ -4). Cox-regression analysis was performed for each delirium/coma status with age, APACHE-II score, sepsis, mechanical ventilation use, ICU admission type, and cumulative 28-day haloperidol delirium treatment dose considered as covariates.

**RESULTS:** A total of 1495 patients [mean age: 66±13, APACHE-II: 19±7, 44% medical, 77% ventilated, 31% sepsis, median [IQR] 0mg [0-7] haloperidol, incident delirium 36% (duration median 2d [1-4]), median days with delirium 0[0-2], coma 1 [0-3], or both 2 [0-5] (over 28d)] were included. Mortality at 28 days = 17%; 90 days = 21%. Neither incident delirium (28-day hazard ratio [HR]=1.02, 95% CI=0.75-1.39; 90-day HR=1.05, 95% CI=0.79-1.38), its duration (28-day HR=1.05, 95% CI=0.99-1.11; 90-day HR=1.04, 95% CI=0.99-1.10), nor 28-day delirium days (28-day HR=1.00, 95% CI=0.95-1.05; 90-day HR=1.02, 95% CI=0.98-1.07) are associated with mortality. Both 28-day coma days (28-day HR=1.05, 95%CI=1.02-1.08; 90-day HR=1.05,95% CI=1.02-1.08) and 28-day delirium/coma days (28-day HR=1.03, 95% CI=1.00-1.05; 90-day HR=1.034, 95% CI=1.01-1.06) are associated with mortality.

**CONCLUSION:** ICU incident delirium and its duration is not associated with increased mortality. Additionally, days with delirium in the first 4 weeks after ICU admission was also not associated with mortality. However, each day with coma during this 4 week period increases the risk of death by 5%.

## DRUG INFORMATION

**96. Types and sources of pharmaceutical counseling services in the regional teaching hospital in taiwan during 2012-2016** Chia-Chung Tsai, MS, *Shih-Chieh Shao, MS*, Hui-Yu Chen, MS; Department of Pharmacy, Keelung Chang Gung Memorial Hospital, Keelung, Taiwan

**INTRODUCTION:** Pharmacists provided pharmaceutical counseling services to ensure medication quality and safety. Regular analyzing the counseling records could help us to realize the clinical needs of drug information from patients and healthcare providers.

**RESEARCH QUESTION OR HYPOTHESIS:** What were the types and sources of pharmaceutical counseling in the hospital?

**STUDY DESIGN:** Retrospective observational study.

**METHODS:** We analyzed the electronic pharmaceutical counseling records in the regional teaching hospital in Taiwan between 2012 and 2016. We classified each record into two counseling sources, including patients and healthcare providers, and we identified the types of counseling questions, such as drug identification, drug use, drug safety, drug storage, pregnancy and lactation and drug reimbursement. We analyzed the trends of counseling sources and types of counseling questions during the study periods. All analyses were reported by descriptive statistics.

**RESULTS:** There were 36,948 pharmaceutical counseling records which increased from 5,269 in 2012 to 10,365 (+96.7%). Most of counseling was from patients (94.8%), but it decreased from 97.3% in 2012 to 94.2% in 2016. The most common types of counseling questions from patients were drug use (n=27,794, 79.4%) and drug safety (n=4,352, 12.4%). Counseling questions from patients about drug use increased from 79.4% in 2012 to 83.1% in 2016, but drug safety decreased from 14% in 2012 to 10.5% in 2016. Among healthcare providers, doctors accounted for 36.9% of pharmaceutical counseling. The most common types of counseling questions were drug use (n=1,101, 56.8%) and drug identification (n=480, 24.8%). Counseling questions from healthcare providers about drug use increased from 45.1% in 2012 to 70.3% in 2016, but drug identification decreased from 31.9% in 2012 to 15.8% in 2016.

**CONCLUSION:** Pharmacists played the increasing roles to provide pharmaceutical counseling services in the hospital, especially in drug use. Our findings could help to develop strategies to improve current uses of hospital information systems used to answer many counseling questions.

**97. Descriptive analysis of evidence-rating systems used in contemporary meta-analyses of drug effects** *Ryan Rodriguez, Pharm.D.*[1], Kelsey Bridgeman, MS[2]; [1]Department of Pharmacy Practice, University of Illinois at Chicago College of Pharmacy, Chicago, IL [2]College of Pharmacy, University of Illinois at Chicago, Chicago, IL

**INTRODUCTION:** Evidence-rating systems (ERSs) provide systematic evaluations of the quality of individual controlled or observational studies and the overall body of literature included in meta-analyses (MAs). Pharmacists conducting or evaluating MAs require familiarity with ERSs to determine the level of confidence in generated results. Many ERSs have been published, but no consensus exists regarding best practice for their use.

**RESEARCH QUESTION OR HYPOTHESIS:** The objective was to describe the variety of ERSs used in MAs of drug therapy published in high-impact medical journals.

**STUDY DESIGN:** Cross-sectional analysis

**METHODS:** The top 5 ranked general medical journals from 2012 to 2016 were identified. PubMed was searched to identify MAs evaluating drug therapy from these journals. Methods of full-texts were reviewed to ensure the MAs evaluated drug therapy and to identify the ERS used to rate individual studies and the overall body of literature. Frequency of ERS use was analyzed using descriptive statistics.

**RESULTS:** The top-ranked journals were *Ann Intern Med*, *BMJ*, *JAMA*, *Lancet*, *N Engl J Med*, and *PLoS Medicine*. Of 306 articles identified, manual review excluded 102. In 204 evaluated MAs, 83.8% utilized an ERS; the most commonly used was the Cochrane Risk of Bias Tool in 67.2% of all MAs. Overall, 19 unique ERSs, including author-defined systems, were used to evaluate controlled trials in 166 MAs and observational studies in 24 MAs. An ERS was used to evaluate the body of literature in 17.6% of MAs; the most commonly used of 3 unique systems was the GRADE methodology.

**CONCLUSION:** Among numerous ERSs used to evaluate studies in MAs of drug effects, the Cochrane Risk of Bias Tool was most frequently used; ERSs evaluating the body of literature are infrequently used. Pharmacists should have familiarity with ERSs to appropriately evaluate the confidence in results generated by MAs based on the quality of included literature as determined by an ERS.

## EDUCATION/TRAINING

**98. Selecting candidates for pharmacy residencies: a national survey of residency program directors** *Jonathan Cho, Pharm.D., BCPS*; College of Pharmacy, The University of Texas at Tyler, Tyler, TX

**INTRODUCTION:** As healthcare and treatment options continue to evolve and advance, so does the need for pharmacists with additional post-graduate training. The American Society of Health-System Pharmacists (ASHP) envisions that all entry-level pharmacists working in a hospital or health-system have completed a post-graduate year 1 (PGY1) pharmacy residency program. With the growing need for residency trained pharmacists, obtaining a PGY1 residency has become more competitive.

**RESEARCH QUESTION OR HYPOTHESIS:** This study captured the perspectives of PGY1 residency program directors (RPDs) regarding aspects of a candidate's application and interview they found most important when selecting future residents.

**STUDY DESIGN:** A cross-sectional study.

**METHODS:** An electronic survey was distributed via e-mail to PGY-1 pharmacy RPDs. RPDs were identified via the ASHP pharmacy residency directory. Reminders to complete the survey were sent every two weeks and up to three times, during the data collection period. Data related to program demographics, candidate applications, and interview evaluations were collected. RPDs' perceptions were captured via a 5-point Likert scale (1=strongly disagree; 5=strongly agree).

**RESULTS:** A total of 327 RPDs completed the survey. RPDs highly considered overall fit (mean Likert score; 4.9), letters of recommendation (4.6), and letter of interest (4.5) when inviting candidates for on-site interviews. Residency programs focusing in acute care valued hospital pharmacy work experience more compared to non-acute care focused residency programs (4.2 vs. 2.9). ASHP residency showcase attendance (2.6) was not viewed as important when considering candidates for onsite interviews. During the interview, critical thinking ability (4.8), verbal communication (4.8), and overall compatibility (4.9) were viewed as highly important when considering ranking of candidates.

**CONCLUSION:** This study highlights the features that RPDs view as important when considering residency applicants. Results from this study can be used to provide prospective residents guidance on ways to better prepare themselves for residency applications.

**99E. Interprofessional education and collaborative practice in residency: pharmacy residency programs embedded in family medicine residency programs** Jody Lounsbery, Pharm.D., BCPS[1], *Jennie Jarrett, Pharm.D., BCPS, MMedEd*[2]; [1]University of Minnesota College of Pharmacy Department of Pharmaceutical Care & Health Systems, Minneapolis, MN [2]College of Pharmacy; Department of Pharmacy Practice, University of Illinois at Chicago, Chicago, IL

Presented at Society of Teachers of Family Medicine Annual Spring Conference, Washington D.C., My 5-9, 2018.

**100. Perceived value of supplemental infectious diseases course content through social media** *Elias Chahine, Pharm.D., FCCP, BCPS (AQ-ID)*, Rebecca Elyea, Pharm.D. Candidate, Laura Neubauer, Pharm.D. Candidate and Catherine Harrington, Pharm.D., Ph.D.; Lloyd L. Gregory School of Pharmacy, Palm Beach Atlantic University, West Palm Beach, FL

**INTRODUCTION:** The use of social media platforms as an educational tool is an innovative way to engage students in the learning process; however, there are limited studies that have analyzed the value of this approach within pharmacy education.

**RESEARCH QUESTION OR HYPOTHESIS:** Does supplemental content provided on social media to third-year pharmacy students enrolled in an infectious diseases pharmacotherapy course provide value?

**STUDY DESIGN:** Single center intervention with pre/post perception survey.

**METHODS:** Third-year pharmacy students enrolled in the infectious diseases pharmacotherapy course were administered a pre-survey at the beginning of the course. All students were invited to follow existing infectious diseases-centric social media profiles on Instagram, Facebook, and Twitter (@IDstewardship). Over 15 weeks, in addition to the content normally posted to these accounts, targeted content was posted on class days that complimented the subject matter for that day. A post-survey was administered at the end of the course. Survey items were ranked using a Likert scale. Data were analyzed with non-parametric Wilcoxon Rank-Sum tests using the SAS Enterprise software.

**RESULTS:** A total of 25 students completed the study. The perceived mean value on the survey was 14.6± 3.13 out of a possible 21 points. There was no significant difference in value before and after being exposed to the supplemental content (p=0.22). Students aged 27-37 (40%) valued the content more than those aged <27 years old (p=0.0036) according to the following three survey domains: new content (p=0.0203), guideline links (p=0.0465), and questions that generated discussion (p=0.0257). The majority of students (96%) reported intentions to continue to follow the social media profiles after the study.

**CONCLUSION:** The students' perceived value of supplemental educational content on social media did not change over the course of the semester, indicating that the campaign met their original expectations. These results provide further insight to the potential usefulness of incorporating social media into pharmacy education.

**101. Impact of computer-based simulation on cardiovascular pharmacotherapeutic knowledge retention in large classroom setting**

*Angela Bingham, Pharm.D., BCPS, BCNSP, BCCCP*, James Hollands, Pharm.D., BCPS- AQ Cardiology, Lisa Charneski, Pharm.D., BCPS and Michael Cawley, Pharm.D., RRT, CPFT, FCCM; Department of Pharmacy Practice and Pharmacy Administration, University of the Sciences – Philadelphia College of Pharmacy, Philadelphia, PA

**INTRODUCTION:** Computer-based simulation has demonstrated improved achievement of cardiovascular pharmacotherapeutic learning goals and outcomes in the computer lab setting. Evidence suggests that emotional arousal increases the likelihood of memory enhancement, and theoretically, the use of computer-based simulation may offer an advantage over traditional didactic cases in the large classroom setting. However, outcomes comparing these methods have not been evaluated.

**RESEARCH QUESTION OR HYPOTHESIS:** Computer-based simulation will increase student pharmacists' cardiovascular pharmacotherapeutic knowledge retention in the large classroom setting compared to traditional didactic cases.

**STUDY DESIGN:** Single center, retrospective review.

**METHODS:** Students in a required course for second professional year Pharm.D. students completed in-class cases for ischemic stroke (computer-based simulation) and venous thromboembolism (traditional didactic cases) in a large classroom setting. Knowledge retention for ischemic stroke and venous thromboembolism were assessed by comparing in-class question results, utilizing Bloom's Taxonomy methodology, two months after instruction. A survey was administered after instruction to assess students' attitudes and perceptions regarding computer-based simulation in the large classroom setting. Descriptive statistics and Fisher's exact test were used for analysis. Statistical significance was defined as a $P < 0.05$.

**RESULTS:** The percentage of students correctly answering in-class questions two months after ischemic stroke (computer-based simulation) and venous thromboembolism (traditional didactic cases) in large classroom setting (n=185) was 40.2% vs 68.7% respectively (p <0.001). While 58% of students strongly agreed or agreed that computer-based simulation completed in the large classroom setting enhanced their learning, only 16% felt an emotional connection to the simulated patient.

**CONCLUSION:** Computer-based simulation did not increase cardiovascular pharmacotherapeutic knowledge retention in the large classroom setting compared to traditional didactic cases. The large classroom setting was unable to elicit the emotional arousal needed to increase the likelihood of memory enhancement. Future studies should evaluate cardiovascular pharmacotherapeutic knowledge retention after computer-based simulation in the computer lab setting and experiential education.

**102. Correlation between pharmacy learner interventions and time spent at an academic medical center** Johanna Dresser, Pharm.D. Candidate[1], *Meredith Welty, Pharm.D. Candidate*[1], Lisa Brennan, Pharm. D.[2], Amy Loken, Pharm.D.[3], Sarah Nisly, Pharm.D., BCPS, FCCP[1]; [1]Wingate University School of Pharmacy, Wingate, NC [2]Wake Forest Baptist Health, Winston Salem, NC [3]Wake Forest Baptist Health, Winston-Salem, NC

**INTRODUCTION:** Previous studies have demonstrated that pharmacy student clinical interventions provide cost-savings for the institution over the course of a single rotation. It has not been clearly established whether student interventions change over the course of an academic year. This study describes the incidence and cost-analysis of pharmacy learner interventions over time.

**RESEARCH QUESTION OR HYPOTHESIS:** The frequency and cost-savings of learner interventions increases throughout an academic year.

**STUDY DESIGN:** Single-center rolling retrospective review

**METHODS:** Patient care interventions are logged by students in the electronic medical record (EMR) as part of routine practice. Intervention data was collected through a monthly EMR report. All student rotations completed within the medical center system during the study period were eligible for inclusion. The primary endpoint was change over time in the frequency of interventions made per student, per rotation block. The main secondary endpoint was change over time of the cost analysis of interventions per student, per rotation block.

**RESULTS:** During the study period 33 students were eligible for inclusion. The average number of interventions documented per eligible student decreased by an average of 15.3 interventions per student per block from the first through fourth blocks (p = 0.49). The average cost-savings of documented interventions documented per student per block decreased by an average of $2,849 per block from the first through fourth blocks (p = 0.42). A total of 736 interventions were documented during the study period, for a total cost-savings of $113,117.

**CONCLUSION:** Pharmacy learner interventions result in cost savings to the institution at which they practice. Despite the decrease in the number of documented interventions, the impact and cost-savings that learners provide to an institution are still evident. Additional longitudinal data throughout the entirety of an academic year is forthcoming.

**103. Sustainable global health improvement project: a study determining the impact of providing education to healthcare staff in a low-resourced setting** *Michelle Holm, Pharm.D.., BCPS*[1], Holly Burkhartzmeyer, M.A.N., RN[2]; [1]Department of Pharmacy, Mayo Clinic, Rochester, MN [2]Department of Nursing, Mayo Clinic, Rochester, MN

**INTRODUCTION:** Global health education research, thus far, has focused on the short-term effects of providing education and direct patient care. Assessment of long-term knowledge gain, however, is needed to determine whether education knowledge transfer is effective and sustainable.

**RESEARCH QUESTION OR HYPOTHESIS:** The use of a structured education tool is associated with increased short-term and long-term medical knowledge improvement.

**STUDY DESIGN:** This prospective pre-post cohort study was conducted at Hospital Albert Schweitzer (HAS) in Deschapelles, Haiti,

with 62 nurses invited to participate in 19 educational trainings provided by Mayo Clinic pharmacy and nursing staff over one year.

**METHODS:** Each lecture focused on a specific nursing topic, and on average, 34 nurses attended each lecture. The majority of nurses had received 3 years of nursing education and had been employed at HAS for 6-10 years prior to the educational study. Quantitative assessments were obtained through multiple-choice tests at three points in time: before each lecture, after each lecture, and 6 months following the lecture using the McNemar test. Qualitative data were obtained through focus sessions and self-assessments throughout the study.

**RESULTS:** Pretest and immediate posttest results were statistically significant, showing improvement in 16 of 19 lectures (84%) (all *P*<.05), and results from the pretest to the 6-month test showed improvement in 3 of 19 lectures (16%) (all *P*<.05). Qualitative data results depicted an increase in confidence levels and improvement in patient care activities.

**CONCLUSION:** Based on qualitative findings, there was added value in providing nursing education to the nursing staff through the improvements seen in patient care activities. Short-term knowledge gain was recognized in the majority of lectures provided yet minimal long-term knowledge gain was depicted through test scores. To ensure sustainability when providing education further educational studies are needed.

**104. Accomplishing cape domain 3 during APPE: student perceptions** *Susan Smith, BS, Pharm.D.*, Sarah Nisly, Pharm.D., Jamielynn Sebaaly, Pharm.D., Lisa Brennan, Pharm.D., Wesley Haltom, Pharm.D., Lisa Meade, Pharm.D.; Wingate University School of Pharmacy, Wingate, NC

**INTRODUCTION:** Limited literature exists on the accomplishment of Center for the Advancement of Pharmacy Education (CAPE) outcomes. CAPE's Domain 3 Approach to Practice and Care includes specific learning objectives within six subdomains. As Advanced Pharmacy Practice Experiences (APPE) focus on student pharmacists' approach to practice, evaluating accomplishment of these outcomes is important to analyze for curricular quality assurance. Students at a private university complete APPE in five distinct geographical regions and two concentrated experiences within those regions. Student perceptions of accomplishment of CAPE outcomes while on APPE and the correlation to region assignment may be useful for schools of pharmacy to ensure high quality clinical experiences for student pharmacists.

**RESEARCH QUESTION OR HYPOTHESIS:** What are the differences in accomplishment of CAPE 3 subdomains during the APPE year**?**

**STUDY DESIGN:** Survey research, educational

**METHODS:** An 18-item electronic survey was distributed to 88 pharmacy students during their penultimate 5-week APPE rotation. The survey assessed whether students had at least 1 opportunity to achieve Domain 3 outcomes. Affirmative responses prompted students to report a percentage of successful accomplishment of the outcomes. Descriptive and inferential statistics were performed (v9.4, SAS Institute Inc.) A p-value of <0.05 was considered statistically significant.

**RESULTS:** The survey response rate was 53% (n=47). Respondents reported a median accomplishment of ≥ 85% (range 85-99%) for each subdomain with no significant difference between subdomains (p>0.05). Outcomes related to patient advocacy (85%) and problem solving (88%) accounted for the lowest completion percentages. Overall student perception of accomplishment among the six subdomains did not differ according to region or sub-region assignment (p=0.12 and p=0.10), respectively.

**CONCLUSION:** Most students perceived accomplishment of the outcomes associated with CAPE Domain 3. The different regional assignments did not have an impact on student perceptions of accomplishing the outcomes. Future studies evaluating the achievement of objectives related to patient advocacy and problem solving may be warranted.

**105E. Long-term impact of a general medicine elective course on student perceptions of APPE readiness** Dayna LeSeuer, Pharm.D.[1], *Alexa Carlson, Pharm.D., BCPS*[2], Stephanie Sibicky, Pharm.D., BCPS, CGP[3], Mark A. Douglass, Pharm.D.[4], Margarita V. DiVall, Pharm.D., MEd, BCPS[5], Michael J. Gonyeau, BSPharm, Pharm.D., MEd, BCPS, FCCP[5], Adam B. Woolley, Pharm.D., BCPS[6], Jason Lancaster, Pharm. D., MEd[5]; [1]Alnylam, Boston, MA [2]Northeastern University-– Bouvé School of Pharmacy, Boston, MA [3]Northeastern University, Boston, MA [4]Northeastern University Department of Pharmacy Practice/Boston Medical Center, Boston, MA [5]School of Pharmacy, Northeastern University, Boston, MA [6]Northeastern University Department of Pharmacy Practice, Boston, MA

Presented at the American Association of Colleges of Pharmacy Annual Meeting, Nashville, TN, July 15-19, 2017.

**106E. Preceptor and resident perceptions of entrustable professional activities (EPAS) for postgraduate pharmacy training** *Sarah Schweiss, Pharm.D., BCACP*[1], Jean Moon, Pharm.D., BCACP[2], Jody Lounsbery, Pharm.D., BCPS[3], Amy Pittenger, Pharm.D., MS, Ph.D.[2]; [1]Pharmacy Practice & Pharmaceutical Sciences, University of Minnesota College of Pharmacy, Duluth, MN [2]Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN [3]University of Minnesota College of Pharmacy Department of Pharmaceutical Care & Health Systems, Minneapolis, MN

Presented at the Pharmacy Education 2018 Conference of the American Association of Colleges of Pharmacy, Boston, MA, July 21-25, 2018.

**107. Perceptions of pharmacy faculty and students regarding the use of standardized patients for objective structured clinical examinations** *Jonathan Cho, Pharm.D., BCPS*[1], Takova Wallace, Pharm.D., BCACP[2], Frank Yu, Pharm.D.[3]; [1]College of Pharmacy, The University of Texas at Tyler, Tyler, TX [2]Department of Clinical Pharmacy, The

University of Texas at Tyler, Tyler, TX [3]The University of Texas at Tyler, Tyler, TX

**INTRODUCTION:** Demonstrating clinical competency and communication skills are necessary qualities of a pharmacist. One means of assessing these attributes in doctor of pharmacy programs is through objective structured clinical examinations (OSCEs). OSCEs require students to perform a variety of clinical functions while interacting with simulated patients to mimic actual practice environments. However, the simulated patient strategies used differs considerably.

**RESEARCH QUESTION OR HYPOTHESIS:** Do pharmacy students and faculty members perceive standardized patients (SPs) to be beneficial in administering OSCEs?

**STUDY DESIGN:** A cross-sectional study.

**METHODS:** A 10-item, electronic survey was sent to all 67 pharmacy students and select faculty members that participated in the OSCE during the Spring 2018 semester. Data collected included students' demographic information, students' perceived level of confidence related to communicating, making recommendations, and providing counseling to patients, and faculty members' perceptions related to student-patient interactions using SPs.

**RESULTS:** Fifty-four (80.6%) students and twelve (92.3%) faculty members completed the survey. When asked about their interactions with SPs, 42 (77.8%) students either agreed or strongly agreed that SPs portrayed patient more realistically and 41 (75.9%) students perceived SPs created a more comfortable environment for patient communication when compared to non-SPs. Thirty-six (66.7%) students either agreed or strongly agreed to feeling more confident when communicating with patients and 33 (61.1%) felt more confident making recommendations. Ten (83.3%) faculty members either agreed or strongly agreed that SPs portray patient interactions more realistically and seven (58.3%) felt SPs were more consistent in their simulated patient portrayal for the duration of the OSCE.

**CONCLUSION:** Pharmacy students felt more confident in their ability to communicate and interact with the patient during their OSCEs when SPs were used. Students and faculty members perceived SPs to portray patient interactions more realistically compared to non-SPs and recommend the continued use of SPs for OSCEs.

**108. The impact of international interprofessional experiences on perceptions of pharmacist-physician relationships** *Miranda Andrus, Pharm.D., BCPS, FCCP*[1], Emily Powell, Pharm.D.[2], Taylor Steuber, Pharm.D.[3]; [1]Department of Pharmacy Practice, Auburn University/UAB-Huntsville Family Medicine Center, Huntsville, AL [2]East Alabama Medical Center, Opelika, AL [3]Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Huntsville, AL

**INTRODUCTION:** The Accreditation Council for Pharmacy Education (ACPE) has placed emphasis on interprofessional education, as have accrediting bodies of other healthcare disciplines. International medical mission trips offer a unique opportunity for interprofessional collaboration. Underprivileged areas with unique medical needs and limited resources cultivate an educational opportunity requiring teamwork, ingenuity, and optimization of roles within an interprofessional team.

**RESEARCH QUESTION OR HYPOTHESIS:** Can an international interprofessional medical mission trip positively impact perceptions of pharmacist-physician relationships?

**STUDY DESIGN:** Prospective survey of medical and pharmacy students participating in an international medical mission trip.

**METHODS:** An anonymous survey was administered to 17 students before and after completion of a one-week international medical mission trip to the Dominican Republic. Each participant was asked to rank on a scale from "strongly disagree" to "strongly agree" their perceptions of pharmacists as an integral part of medical mission trips, their level of confidence in communication with other healthcare disciplines, and whether they believed interprofessional teams are necessary in providing optimal patient care. Responses were matched and changes in perceptions were analyzed using Wilcoxon Signed Rank test. The SPICE-R2 instrument was administered after trip to measure attitudes toward interprofessional teams.

**RESULTS:** Of the 17 participants, 100% responded to both surveys. Significant improvements were seen in the perception of pharmacists as an integral part of medical mission trips (p=0.035) and confidence in the ability to communicate with other healthcare disciplines (p=0.033). All students stated they would recommend this experience, and agreed that interprofessional experiences enhance their team work skills and should be incorporated into their education. The results of the SPICE-R2 demonstrated positive perceptions of interprofessional teams, with all questions having a median of "agree" or "strongly agree."

**CONCLUSION:** An international interprofessional experience improved the perception of pharmacist-physician relationships. The experience increased student confidence, provided understanding of other healthcare disciplines, and cultivated interest in future interprofessional collaboration.

**109. Assessment of English language proficiency scores and academic performance in an English-based curriculum for pharmacy students with English as a second language** *Justin Tenney, Pharm.D.*[1], Maria Paiva, Pharm.D.[2], Qianwen Wang, Ph.D.[3]; [1]School of Pharmacy, The Chinese University of Hong Kong, Shatin, Hong Kong [2]Sidra Medicine, Doha, Qatar [3]The Chinese University of Hong Kong, Shatin, Hong Kong

**INTRODUCTION:** The diversity of students admitted into healthcare education programs and the international adoption of English taught curriculums is increasing. English proficiency tests are often a component of admission criteria, which is also the current practice for Hong Kong pharmacy schools.

**RESEARCH QUESTION OR HYPOTHESIS:** To determine if there is a relationship between English language proficiency and Grade Point Average (GPA) in pharmacy students with English as a second language (ESL).

**STUDY DESIGN:** Students without English as their first language graduating from the 4-year bachelor of pharmacy program from 2016 to 2018 were invited to participate in the study.

**METHODS:** We compared pharmacy students' pre-admission ESL scores to their cumulative GPA at graduation. Correlation of GPA to Mathematics, Chemistry and Native language (Cantonese) scores were used as points of reference to gauge the degree of correlation.

**RESULTS:** Out of 151 students assessed, 113 students participated in the study with 55 male and 58 female students. Statistical analyses showed a strong correlation between pre-admission ESL scores and cumulative graduating GPA (r = 0.273; p = 0.003). Though weaker, the pre-admission Mathematics scores demonstrated a correlation to cumulative graduating GPA as well (r=0.187; p = 0.048). Native language and chemistry scores did not correlate with graduating GPA.

**CONCLUSION:** This is the first study of its kind in pharmacy students and students with Chinese as their native language. It is also the first study to compare preadmission ESL scores to cumulative graduating GPA. This study provides evidence that ESL proficiency scores correlated with academic performance.

**110. Evaluation of an infectious diseases healthcare hashtag as an educational tool** *Trinh Vu, Pharm.D. Candidate (University of Georgia)*[1], Katherine Lusardi, Pharm.D.[2], Erin McCreary, Pharm.D., BCPS[3], Kayla R. Stover, Pharm.D., BCPS-ID[4], Sarah T Withers, Pharm.D.[5], Christopher Bland, Pharm.D., BCPS, FIDSA[6]; [1]University of Georgia College of Pharmacy, Athens, GA [2]University of Arkansas for Medical Sciences, Little Rock, AR [3]University of Wisconsin Hospitals and Clinics (UW Health), Madison, WI [4]Department of Pharmacy Practice, University of Mississippi School of Pharmacy, Jackson, MS [5]Pharmacy Services, Greenville Health System, Greenville, SC [6]Clinical and Administrative Pharmacy, University of Georgia College of Pharmacy, Savannah, GA

**INTRODUCTION:** Social media (such as Twitter) is increasingly used as an educational platform, allowing healthcare professionals to share information in real time. Hashtags are utilized in social media to group messages or posts and facilitate a search of related content. This study sought to explore the use of a healthcare hashtag as an educational tool.

**RESEARCH QUESTION OR HYPOTHESIS:** How is the healthcare hashtag #IDPRN utilized as an infectious diseases educational tool?

**STUDY DESIGN:** The 2015-2016 ACCP Infectious Diseases Practice and Research Network (IDPRN) Executive Committee created #IDPRN to distribute and group ID-related educational content via Twitter. This hashtag was registered with Symplur, an analytics tool, to gather data on usage. ID PRN members were encouraged to use #IDPRN whenever possible when posting ID-related educational content.

**METHODS:** Symplur and Twitter were queried for the top five uses associated with #IDPRN from August 2017-May 2018 including tweet, retweets, and total impressions. Data were also collected on the top five individual users of #IDPRN.

**RESULTS:** The top five uses of #IDPRN based on total number of tweets or retweets were educational real-time chat (N=1027), infectious disease conference content (N=585), distribution of published articles (N=231), personal/award mentions (N=43), and general pharmacy conference content (N=35). The top five uses of #IDPRN based on number of impressions were educational real-time chat (N=1,538,777), infectious diseases conference content (N=498,623), sharing published articles (N=146,470), general pharmacy conference content (N=36,678), and personal/award mentions (N=27,289). The top five users of #IDPRN were current/former ID PRN executive committee members (4) and an infectious diseases pharmacy organization.

**CONCLUSION:** A substantial amount of educational content was distributed via Twitter using an infectious diseases healthcare hashtag. The impact of the rapid and widespread distribution of educational content requires further investigation for each healthcare speciality.

**111. Implementation of unlimited formative quizzes in a large, cohort therapeutics course** Sarah Scott, Pharm.D., *Stephanie L. Sibicky, Pharm.D., BCGP, BCPS* and Brandon Dionne, Pharm.D., BCPS-AQ ID, AAHIVP; Northeastern University, Boston, MA

**INTRODUCTION:** Formative quizzes have been shown to help increase overall course performance; however, the effect of unlimited-attempt quizzes on exam scores is not well-described.

**RESEARCH QUESTION OR HYPOTHESIS:** Is performance on unlimited-attempt formative quizzes predictive of exam scores?

**STUDY DESIGN:** Retrospective cohort study.

**METHODS:** Students in their third professional year therapeutics course were required to take weekly formative quizzes with unlimited attempts to achieve a mastery score of ≥ 80%. The number of total attempts, number of attempts to mastery, and percentage scores for each quiz as well as the percentage scores for each exam in the course were obtained for each student from the learning management system. Quiz scores were grouped by corresponding exam material. Average scores, average total attempts, average attempts to mastery, and the proportion of quizzes achieving 100% were calculated for each group of quizzes and were evaluated for correlation with exam scores. Spearman's rank correlation for univariate analyses and linear regression for multivariate analysis were performed using SPSS.

**RESULTS:** A total of 135 students were included. A positive correlation was found between exam score and both the average quiz score ($r_S$ = 0.194, p < 0.001) and percentage of quizzes achieving 100% ($r_S$ = 0.149, p = 0.003), while a negative correlation existed between exam score and both the average number of total attempts ($r_S$ = -0.091, p = 0.069) and average number of attempts to mastery ($r_S$ = -0.289, p < 0.001). After adjusting for individual students and average number of total attempts, higher quiz scores (B = 0.379, p <0.001) remained associated with higher exam scores.

**CONCLUSION:** Higher quiz scores were predictive of higher overall exam scores regardless of individual student or number of attempts. Students may benefit from utilizing the quiz to achieve a 100% rather than achieve mastery at ≥ 80%.

**112E. Identification of essential knowledge for inpatient general medicine advanced pharmacy practice experiences** *Rebecca Moote, Pharm.D., MSc, BCPS*[1], Shannon Knutsen, Pharm.D., BCPS[2], Michele Claiborne, Pharm.D., BCPS[2]; [1]College of Pharmacy, The University of Texas at Austin, San Antonio, TX [2]School of Pharmacy, Regis University, Denver, CO

Presented at the American Society of Health-System Pharmacists Midyear Meeting, Orlando, Florida, December 2017.

**113. Application of the PPCP via student-prepared patient cases within a pharmacotherapeutics course** *Monica Fahmy, Pharm.D. Candidate 2020*[1], Urvinder (Silky) Kaur, Pharm.D. Candidate 2020[1], Richard Silvia, Pharm.D., BCPP[2], Robert Dufresne, Ph.D., Ph.D., BCPP, BCPS[3]; [1]MCPHS University, Boston, MA [2]Department of Pharmacy Practice, MCPHS University, Boston, MA [3]University of Rhode Island, Kingston, RI

**INTRODUCTION:** The Pharmacist's Patient Care Process (PPCP) is a required part of the ACPE Pharm.D. curriculum. Pharmacy students need proficiency in using the PPCP to provide optimal patient care. Patient cases related to pharmacotherapeutics topics can be used to reinforce course material and the PPCP. The use of student-prepared cases for peer-to-peer education of the PPCP has not been reported in the literature.

**RESEARCH QUESTION OR HYPOTHESIS:** PPCP application via student-prepared patient cases related to pharmacotherapeutics topics aids students in PPCP proficiency and lecture material reinforcement.

**STUDY DESIGN:** The IRB approved a 10-item survey for distribution to the PY2 class taking pharmacotherapeutics during Fall 2017 to evaluate the impact of student-prepared cases in reinforcing the PPCP method and course material.

**METHODS:** Two PY2 students prepared cases for sixteen topics and shared them with their classmates. Students completed these cases utilizing the PPCP. Answer keys were provided one week after the original cases. At semester's end, the survey was distributed, and responses tabulated in Microsoft Excel. Survey responses were analyzed via Goodman and Kruskal's Gamma using SYSTAT 13 software. A Bonferroni correction for the fourteen separate analyses required a criterion of $p<.0035$ to yield an overall significance level of $p<.05$.

**RESULTS:** Thirty-one percent (n=93) of students completed the cases and survey. There was a significant ($p<.05$) positive association as observed between completing more cases and utility in understanding the course material (gamma=0.41), but not understanding the PPCP (gamma=0.33). Positive associations were also observed between using the PPCP to attempt the cases and both understanding the course material (gamma=0.35) and the PPCP (gamma=0.40). Students who would be more likely to use similar cases in future courses were associated with increased utility in understanding course material (gamma=0.54) and the PPCP (gamma=0.45).

**CONCLUSION:** Students who utilized a higher number of cases appropriately were more likely to learn the PPCP method and understand course material.

**114. Hands-on learning activity to improve student pharmacist confidence with urinary incontinence products** Emily Peron, Pharm.D., MS, *Emily Harmon, BS*, Laura Morgan, Pharm.D., MEd, Kacie Powers, Pharm.D., Benjamin Van Tassell, Pharm.D.; School of Pharmacy, Virginia Commonwealth University, Richmond, VA

**INTRODUCTION:** Urinary incontinence (UI) is a common problem in the US population, particularly among older adults. Since many UI products are available for purchase over-the-counter, pharmacists have a unique opportunity to counsel patients on the appropriate selection and use of these products.

**RESEARCH QUESTION OR HYPOTHESIS:** We hypothesized that a small group, active learning, hands-on experience would improve student pharmacist confidence related to UI products.

**STUDY DESIGN:** Pre/post surveys to assess student pharmacist confidence related to UI products

**METHODS:** Student pharmacists were given a brief introduction to UI pathophysiology, treatment, and OTC products (25 min) followed by 4 patient cases to evaluate in small groups (30 min). To complete the cases, students were required to manually test the absorbent capacity of currently available UI products including multiple brands of pads, liners, and diapers. A survey of 5 questions was administered immediately before and after the activity using a 5-pt Likert scale (paired t-test).

**RESULTS:** Student confidence significantly improved across all five survey questions (see Table).

| Item | Pre | Post | Change | P |
|---|---|---|---|---|
| 1. I am confident in my ability to identify the type of incontinence a patient is experiencing (e.g., stress, urge, mixed, functional). | 1.93 | 3.82 | +1.89 | <0.001 |
| 2. I am confident in my ability to select the most appropriate OTC absorbent product (e.g., liner, pad, diaper) considering a patient's presenting symptoms. | 1.95 | 4.33 | +2.38 | <0.001 |
| 3. I am confident in my ability to select the most appropriate OTC absorbent product considering a patient's financial situation. | 2.26 | 4.24 | +1.98 | <0.001 |
| 4. I am confident in my ability to distinguish between men's and women's OTC absorbent products. | 3.11 | 4.75 | +1.64 | <0.001 |
| 5. I am confident in my ability to counsel a patient on the proper use of OTC absorbent products. | 2.05 | 4.31 | +2.26 | <0.001 |

**CONCLUSION:** A hands-on learning activity significantly improved student pharmacist confidence working with UI products.

**115. A systematic approach to team creation in a large classroom setting** *Marian Gaviola, Pharm.D.*[1], Meredith Howard, Pharm.D.[1], Adenike Atanda, Pharm.D.[1], W. Cheng Yuet, Pharm.D.[2]; [1]Department of

Pharmacotherapy, University of North Texas System College of Pharmacy, Fort Worth, TX [2]Pharmacotherapy, University of North Texas System College of Pharmacy, Fort Worth, TX

**INTRODUCTION:** Team-based learning (TBL) is widely used in pharmacy education with evidence for multiple benefits. Unfortunately, limited data exists to support optimal methods for team creation, leading to randomization of team members. There is a need to determine best methods of team creation for TBL within pharmacy education.

**RESEARCH QUESTION OR HYPOTHESIS:** To implement and evaluate a systematic approach to team creation and compare its effects on team dynamics versus teams created by random selection.

**STUDY DESIGN:** Student perceptions survey on curricular innovation related to team creation and peer evaluation.

**METHODS:** Two concurrent required courses were used to evaluate and compare team creation by CATME Team Maker versus random selection among third-year pharmacy students. For systematic team creation within one course, CATME incorporating student-specific variables such as preferences related to availability, leadership style, and pharmacy organization involvement to create teams. A matched pre- and post-course survey assessed student perceptions of team creation and peer evaluation as well as preferences and perceptions surrounding characteristics of effective teams. An additional survey at the end of the semester compared team effectiveness by CATME versus random creation.

**RESULTS:** 109 students were enrolled in the courses, and 63 (58%) completed matched pre- and post-course surveys. Survey results revealed students preferred increased classroom skill heterogeneity ($p=0.04$). Students perceived better team effectiveness with CATME-created groups with decreased task, relationship, and process conflict, along with increased task attraction and interpersonal cohesiveness compared with random allocation. There were no significant differences in individual examination performance between the two courses (mean score $84 \pm 8.6$ vs $86 \pm 9.5$, $p=0.17$).

**CONCLUSION:** A systematic approach to team creation improved student-perceived team dynamics but had no significant effect on individual examinations. The use of CATME provides a breadth of information that may help faculty more effectively manage teamwork within large classroom setting.

**116. Design and evaluation of a third year didactic advanced cardiovascular pharmacotherapy elective focused on APPE preparedness**

*Caitlin Gibson*, *Pharm.D.*, Meredith Howard, Pharm.D.; Department of Pharmacotherapy, University of North Texas System College of Pharmacy, Fort Worth, TX

**INTRODUCTION:** During the didactic curriculum, students often lack exposure and practice with numerous activities encountered on Advanced Pharmacy Practice Experience (APPE) rotations, which may limit student preparedness for APPEs.

**RESEARCH QUESTION OR HYPOTHESIS:** Will a clinical elective course comprised of activities frequently encountered during the APPE year improve student perceptions of APPE readiness?

**STUDY DESIGN:** Single-institution, pre- and post-survey and qualitative analysis of third-year pharmacy students

**METHODS:** Pharmacy students enrolled in the Advanced Cardiovascular Pharmacotherapy elective completed activities including a journal club, drug monograph, topic discussion, oral case presentation, simulation lab, and clinical controversy presentation. Students completed these activities individually or in teams and received feedback from two course directors in a manner consistent with APPE feedback. Student perceptions were assessed via formal pre- and post-course surveys as well as a midpoint "stop, start, continue" survey addressing the impact of the course and their perceived readiness for APPE rotations.

**RESULTS:** Twelve students were enrolled in the course; eight students completed the pre-survey and 12 completed the post-survey. Compared to pre-course evaluations, students reported increased confidence in analyzing patient data, creating individualized care plans, analyzing biomedical literature, and delivering evidence-based presentations ($p<0.05$). Students identified journal club (58%), topic discussions (42%), and monographs (25%) as the most valuable course activities. In open-ended responses, some students reported feeling more prepared for rotations.

**CONCLUSION:** Integrating APPE activities into a didactic elective improves student-perceived readiness for rotations. An additional survey will be sent to students after completion of four APPE rotations to determine the course's long-term impact. The surveys will also be distributed to students enrolled in future iterations of this course to increase the sample size and further assess the impact of the course on perceptions of APPE readiness across multiple cohorts. Additionally, a control group of students not enrolled in the elective will be surveyed for future iterations.

**117. Implementation of a distance-based clinical capstone course to improve practice-related confidence in global Pharm.D. candidates**

*Paul Reynolds*, *Pharm.D.*, Joseph Saseen, Pharm.D., Jennifer Trujillo, Pharm.D., Scott Mueller, Pharm.D., Sunny Linnebur, Pharm.D., Lynee Sanute, MLIS, MA, Shaun Gleason, Pharm.D., MGS; Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

**INTRODUCTION:** Clinical capstone courses may improve skill-sets across healthcare education. Effective implementation of a distance-based clinical capstone course for international, practicing pharmacists pursuing a Pharm.D. has not been described.

**RESEARCH QUESTION OR HYPOTHESIS:** Implementation of a distance-based clinical capstone course improves student confidence in key areas related to clinical pharmacy practice.

**STUDY DESIGN:** Educational study with surveys at baseline, midpoint, and course completion. Rubric based assessments were utilized to track competencies regarding different ABOs.

**METHODS:** The distance-based clinical capstone incorporated live case discussions, video-rounding, standardized patient interviews, increasingly-complex case scenarios, group activities, and peer-grading. The primary outcome was improvement in student confidence in

critical thinking, life-long learning, evidence-based medicine (EBM), clinical decision-making, problem-solving and preparedness for advanced pharmacy practice experiences (APPEs). Student surveys (Likert Scale; 1-5, 5 being highest) were conducted at baseline, midpoint, and course completion to assess the primary outcome. Secondary outcomes included achievement of select ability based outcomes (ABOs) assessed using a rubric. Wilcoxon rank-sum testing was used to assess the primary outcome and descriptive statistics for secondary outcomes.

**RESULTS:** The course enrolled 22 students with a mean practice experience of 17 years from several geographic regions. Compared with baseline, both midpoint and post-course surveys (n=20) mean Likert scores increased in critical-thinking (4.76 vs 3.5), life-long learning (4.71 vs 3.7), EBM (4.76 vs 3.4), clinical decision-making (4.66 vs 3.5), problem-solving (4.71 vs 3.72) and preparedness for APPEs (4.71 vs 3.5;P <0.05 for all comparisons). 100% of students achieved competency in advanced patient assessments, 95% in basic healthcare ethics, 95% in basic EBM, 95% in basic professional-stewardship, and 100% in advanced communication.

**CONCLUSION:** Implementation of a distance-based clinical capstone course was effective in improving perceived student confidence in critical-thinking, life-long learning, EBM, and perceived preparedness for APPEs. Most students successfully met key ABOs related to pharmacy practice as a result of this course.

**118. Development of pharmacy residency research resources within the critical care PRN** *Adrian Wong, Pharm.D., MPH*[1], Zachary Smith, Pharm.D.[2], Melissa Bastin, Pharm.D.[3], Joshua DeMott, Pharm.D., MSc[4], Kendall Gross, Pharm.D.[5], Brittany Bissell, Pharm.D., BCCCP[3], Mojdeh Heavner, Pharm.D., BCPS, BCCCP[6], Molly Droege, Pharm.D.[7], Benjamin Hohlfelder, Pharm.D.[8]; [1]MCPHS University, Boston, MA [2]Henry Ford Hospital, Detroit, MI [3]Department of Pharmacy Services, University of Kentucky HealthCare, Lexington, KY [4]Department of Pharmacy, Rush University Medical Center, Chicago, IL [5]University of California, San Francisco; San Francisco, San Francisco, CA [6]University of Maryland School of Pharmacy, Baltimore, MD [7]University of Cincinnati Medical Center, Cincinnati, OH [8]Cleveland Clinic, Cleveland, OH

**INTRODUCTION:** Research projects are often a requirement of pharmacy residency training but resources to conduct these investigations may be lacking. A study found that approximately 60% of residency program directors (RPDs) had low confidence in their resident's ability to perform statistical analyses. A charge was created for the Critical Care PRN Research Committee in 2017 to identify resources residents and RPDs might find helpful in conducting research projects.

**RESEARCH QUESTION OR HYPOTHESIS:** To determine areas for improvement in conducting residency research and identifying the optimal format to distribute this type of resource.

**STUDY DESIGN:** An anonymous voluntary survey was electronically sent in December 2017 to residents and RPDs that were members of the Critical Care PRN.

**METHODS:** The survey was comprised of questions including respondent demographics, resident comfort with research (at beginning of year and December), and the usefulness of potential resources (ranked on a 0-100 scale, with 100 as highest) that the Critical Care PRN could help create. Statistical analysis was completed using R 3.3.3 (R Core Team, Vienna, Austria).

**RESULTS:** There were a total of 132 survey responses, with 129 (97.7%) completing the survey. RPDs accounted for most responses (n=52, 40.3%), with PGY2 Critical Care residents the second most common (n=32, 24.8%). The median change in resident comfort with performing research increased by 15.5 (IQR 10-24.8). A statistical analysis guide was the most useful resource overall (median 80.0, IQR 71.5-100). Residents rated the usefulness of all proposed resources higher when compared to RPDs, with 6 of 8 resources being statistically significant (p <0.05). There were no differences in preference for potential resources by type of institution or by institution bed size.

**CONCLUSION:** Proposed resources appear to have great value to residents and RPDs. Based on these results, a statistical analysis guide is in development. Evaluation of this guide will be completed with the next cohort of pharmacy residents.

**119. Educational intervention in pharmacy and nursing students to affect attitudes and knowledge regarding gender non-conforming individuals** *S. Mimi Mukherjee, Pharm.D.*[1], Carroll-Ann Goldsmith, DSc[2], Ann Lak, MS Nursing[3]; [1]School of Pharmacy, Department of Pharmacy Practice, MCPHS University, Worcester, MA [2]School of Pharmacy, Department of Pharmaceutical Sciences, MCPHS University, Manchester, NH [3]School of Nursing, MCPHS University, Manchester, NH

**INTRODUCTION:** Gender non-conforming individuals have greater dissatisfaction with healthcare due to discrimination and low cultural competency among healthcare professionals. Pharmacy and nursing curricula designate limited time to lesbian, gay, bisexual, transgender, and queer (LGBTQ) health.

**RESEARCH QUESTION OR HYPOTHESIS:** Inter-professional education (IPE) on gender non-conforming individuals will have a positive effect on student knowledge and attitudes. Secondarily, the inter-professional interaction will improve students' collaborative skills.

**STUDY DESIGN:** Paired pre-education and post-education survey.

**METHODS:** Final year pharmacy and nursing students attended a lecture and case discussion on topics including LGBTQ health disparities and LGBTQ-inclusive environments. Small inter-professional groups of students discussed the case and shared thoughts with the larger group. Students were surveyed before and after the program using items from the Attitudes toward LGBT Patients Scale (ATLPS), and the International Collaborative Competencies Attainment Survey (ICCAS), which use Likert scales (range 1 to 5, strongly disagree to strongly agree). Data was analyzed using Wilcoxon signed-rank analysis via Graph Pad Prism.

**RESULTS:** One hundred six students (63 nursing, 43 pharmacy) participated. The majority were ages 18 to 30 (83%), Caucasian (61%),

cisgender women (77%), and heterosexual (83%). After the program, more students felt prepared to talk with LGBTQ patients (means: pre-program = 4.13 (SD 0.93), post-program = 4.32 (SD 0.74); p=0.004); more students felt comfortable if known as someone who cares for LGBTQ patients (means: pre-program = 4.2 (SD 0.95), post-program = 4.45 (SD 0.66); p=0002); and students less strongly disagreed that LGBTQ patients should seek care only from LGBTQ health clinics (means: pre-program = 1.62 (SD 0.89), post-program = 1.93 (SD 1.16); p=0.008). In addition, more students felt better able to promote effective communication among members of an inter-professional team (means: pre-program = 4.37 (SD 0.66), post-program = 4.51 (SD 0.14); p=0.02).

**CONCLUSION:** IPE on LGBTQ health improved student LGBTQ cultural competency, recognition of LGBTQ-specific health needs, and inter-disciplinary communication skills.

**120E. Resident perceptions of a resiliency curriculum in a postgraduate year 1 (PGY-1) pharmacy residency program** Sarah Schweiss, Pharm.D., BCACP[1], *Stephanie Swanson, Pharm.D.*[2]; [1]Pharmacy Practice & Pharmaceutical Sciences, University of Minnesota College of Pharmacy, Duluth, MN [2]University of Minnesota, Minneapolis, MN

Presented at the Best Practices in Medical Education Conference of the University of Minnesota, Minneapolis, MN, May 3, 2018.

**121. Assessing student confidence in interprofessional communication during primary care advanced pharmacy practice experiences (APPES)** Allison Helmer, Pharm.D., BCACP[1], Katelin Lisenby, Pharm. D., BCPS[2], *Sean Smithgall, Pharm.D., BCACP*[1], Dana Carroll, Pharm.D., BCPS, CDE, BCGP[2], E. Kelly Hester, Pharm.D., BCPS, AAHIVP[3]; [1]Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Mobile, AL [2]Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Tuscaloosa, AL [3]Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Auburn, AL

**INTRODUCTION:** Pharmacists must provide patient-specific recommendations to other healthcare workers in a clear, concise, and professional manner while demonstrating expertise. ACPE Standards 2016 indicate students must engage and become competent in effective, interprofessional communication. Pre-APPE questionnaires indicate that students are often uncomfortable interacting with other healthcare professionals to address medication-related problems. Literature indicates that pharmacy student use of situation-background-assessment-recommendation (SBAR) communication techniques in pre-APPE simulated settings improves interprofessional communication. No study has evaluated this technique during APPEs.

**RESEARCH QUESTION OR HYPOTHESIS:** Student confidence in interprofessional communication will improve throughout 5-week primary care APPEs

**STUDY DESIGN:** Retrospective analysis evaluating student confidence in communicating with providers during APPEs via a communication rubric inspired by the SBAR technique

**METHODS:** A rubric was created for student self-assessment of interprofessional communication of background information, assessments, recommendations, and nonverbal communication. Ratings included not confident, moderately confident, or highly confident. Student rubric responses during APPEs with five faculty preceptors from May 2017 to April 2018 were included. Students completed the rubric at least once, preferably at the beginning and end of the APPE. Additionally, a 4-point Likert scale pre-post APPE survey assessed students' communication comfort and perceived benefit of preceptor teaching methods, including the rubric. The primary objective was to assess change in student confidence in interprofessional communication abilities. Data were analyzed using descriptive statistics, Wilcoxon and linear regression.

**RESULTS:** Forty-seven students completed pre-post APPE surveys, 42 completed an initial rubric, and 46 completed a final rubric. All students reported more confidence with interprofessional communication following their APPE in part due to the rubric. Student confidence on each rubric component improved throughout the APPE, independent of rotation block during the year, with the most significant improvements in communicating background information (highly confident: 46% change, $p<0.05$) and assessments (highly confident: 55% change, $p<0.05$).

**CONCLUSION:** Student confidence in interprofessional communication improved during primary care APPEs using a communication rubric.

**122. Assessing advanced pharmacy practice experiences (APPES) readiness skills in third year pharmacy students** *Erenie Guirguis, Pharm.D.*[1], Mariette Sourial, Pharm.D.[2], Jay Jackson, Pharm.D.[3], Harm Maarsingh, Ph.D.[4]; [1]School of Pharmacy, Palm Beach Atlantic University, Lake Worth, FL [2]Lloyd L Gregory School of Pharmacy, Palm Beach Atlantic University, West Palm Beach, FL [3]School of Pharmacy, Palm Beach Atlantic University, West Palm Beach, FL [4]Department of Pharmaceutical Sciences, Lloyd L. Gregory School of Pharmacy, Palm Beach Atlantic University, West Palm Beach, FL

**INTRODUCTION:** The Accreditation Council for Pharmacy Education requires pharmacy schools to determine if students have the knowledge, skills and attitudes to succeed during APPEs. The majority of the developed skill based competencies for APPE readiness are assessed in a course, Case Studies in Pharmacotherapy IV, offered in the final didactic semester prior to APPEs. This course is part of a series focusing on the pharmacist patient care process.

**RESEARCH QUESTION OR HYPOTHESIS:** To assess students' APPE readiness and their perceived ability to perform select APPE-Readiness Competencies prior to and after completion of the APPE Readiness Assessments (ARAs) within the course.

**STUDY DESIGN:** IRB-approved, single-center, quasi-experimental study with a pre and post survey and performance assessments

**METHODS:** Eight APPE readiness competencies were defined by our school. 10 ARAs, including a 5-station OSCE, were administered in the course to assess mastery of these competencies. Student perceived ability to perform each APPE readiness competency was

assessed using an 8-question pre and post survey. The primary endpoint was successful pass rate upon first attempt of ARAs. The secondary endpoint was student perceived ability to perform the APPE readiness competencies upon completion of the course.

**RESULTS:** Upon completion of the course, the average pass rate on first attempt across all 10 ARAs was 92.8%. Out of 62 students, 46 and 45 completed the pre-ARAs and post-ARAs survey, respectively. At the start of the course, 82.2% of the students (strongly) agreed that they were competent to perform the 8 competencies of the ARAs. After performing the ARAs and receiving grades, 92.9% of students (strongly) agreed that they were competent to perform the ARAs on their post-ARAs survey. Importantly, the number of students who 'strongly agreed' in the post-ARAs survey increased 1.8 fold.

**CONCLUSION:** At the end of the didactic portion of the curriculum students at the Gregory School of Pharmacy demonstrated APPE readiness skills.

**123. Preliminary evaluation of addition of transgender patient care into a doctorate of pharmacy curriculum** Cheyenne Newsome, Pharm.D., BCACP[1], *Li Wei Chen, BS*[2]; [1]Department of Pharmacotherapy, College of Pharmacy and Pharmaceutical Sciences, Washington State University, Spokane, WA [2]College of Pharmacy and Pharmaceutical Sciences, Washington State University, Spokane, WA

**INTRODUCTION:** The number of transgender and gender diverse patients seeking care in the United States is increasing. For many, pharmacotherapy is a part of their gender transition. Current literature on instructional methods about this patient population's social and medical considerations is lacking.

**RESEARCH QUESTION OR HYPOTHESIS:** How will pharmacy students' confidence in their abilities to provide culturally and medically competent care to individuals who are transgender change after three hours of instruction? What methods and content do students find most effective to learning?

**STUDY DESIGN:** Pre- and post- intervention survey study.

**METHODS:** Course material encompassing cultural, empathetic and medical considerations for people who are transgender was added to a third-year course in a doctorate of pharmacy curriculum. The materials included a pre-class video and handout, in-class jeopardy game, viewing and discussion of a story about a patient who is transgender, a student gender identity exploration exercise, a panel of people who identify as transgender, and patient cases. An online survey was conducted to assess students' confidence before and after the intervention. Students were also asked to rate how helpful each component of instruction was in changing their confidence to provide competent care to individuals who are transgender. A Mann-Whitney U Test was performed to calculate statistical significance for the change in student confidence.

**RESULTS:** Student confidence to provide competent care to patients who are transgender increased significantly following the intervention. The median confidence level among students increased from 4/10 to 7/10 ($p<0.01$). Students rated the pre-class video, jeopardy game, and patient panel as the most helpful components of instruction.

**CONCLUSION:** Inclusion of materials on transgender pharmacy care showed improvement in students' perceived confidence in caring for transgender patients. The panel discussion was reported as the most helpful component and could be considered for incorporation in other pharmacy school curricula.

**124. Using entrustable professional activities (EPAS) to navigate and evaluate pharmacist skills in a 3-year accelerated pharmacy curriculum** *Brandon Nuziale, Pharm.D., BCACP*, Danielle Small, Pharm.D., Pauline Low, Pharm.D.; School of Pharmacy, Pacific University Oregon, Hillsboro, OR

**INTRODUCTION:** The American Association of Colleges of Pharmacy (AACP) recommends utilizing EPAs to ensure students are practice-ready upon graduation. EPAs are core activities and tasks that new graduates should be able to complete independently, and can therefore guide which clinical skills need curricular coverage. Additionally, AACP has recommended 63 supporting tasks to help schools identify how to ensure students are achieving EPAs. Pacific University School of Pharmacy is a 3-year accelerated Pharm.D. program with clinical skills covered mostly in bi-weekly longitudinal courses.

**RESEARCH QUESTION OR HYPOTHESIS:** Are EPA's appropriately covered and assessed in a modified block 3 -year Pharm.D. curriculum?

**STUDY DESIGN:** Descriptive qualitative research

**METHODS:** Following simple mapping of the curricula to the EPA supporting tasks, a tier system was created to serve as a baseline assessment of EPA coverage, and for future assessment of curricular change. Skills were defined as: Tier 1 – teach in the classroom-based curricula and assess through milestone assessments for program progression. Tier 2 – teach in classroom but skills demonstration not necessary for progression. Tier 3 – not necessary to teach and students are likely exposed during experiential education. These tiers were then used to prioritize curricular aspects needing urgent attention.

**RESULTS:** Tier 1 tasks represented 62% (39/63) of the supporting tasks. Of these critical skills, 28% (11/39) required immediate attention, 64% (25/39) some attention and 7.6% (3/39) no further action. 14% (9/63) of the supporting tasks were Tier 2. Of these, 56% (5/9) needed immediate attention, 33% (3/9) some attention, and 11% (1/9) no attention. 24% (15/63) of the supporting tasks were identified as Tier 3. Of these 6.7% (1/15) required immediate attention and 93% (14/15) did not need further action.

**CONCLUSION:** Creating a tier system to determine placement and degree of assessment for EPA tasks is an efficient methodology to ensure pharmacy curricula optimally prepare students to be practice-ready upon graduation.

**125. Addressing the gaps between education and pharmacy practice on antimicrobial stewardship: a qualitative study among pharmacists in the middle east** *Ziad Nasr, BSc(Pharm), Pharm.D., BCPS*[1], Kerry Wilbur, BSc(Pharm), ACPR, Pharm.D., MScPH, FCSHP[2], Alya Higazy, BSc (Pharm), Pharm.D.[1]; [1]College of Pharmacy, Department of Clinical

Pharmacy and Practice, Qatar University, Doha, Qatar [2]Department of Pharmaceutical Sciences, University of British Columbia, Vancouver, BC, Canada

**INTRODUCTION:** Antimicrobial resistance is a public health issue and is the focus of antimicrobial stewardship (AMS) teams within healthcare institutions. AMS is not comprehensively taught in medical or pharmacy curricula and little is known about the relevance of pharmacist training to meet AMS needs in the Middle East region.

**RESEARCH QUESTION OR HYPOTHESIS:** Do gaps exist between pharmacy education and actual clinical practice with regards to AMS training in Qatar? What are pharmacist's perceptions of AMS roles in hospital environments.

**STUDY DESIGN:** Qualitative study design was adopted.

**METHODS:** Three focus group discussions with a total of 15 pharmacy alumni who are currently practicing as pharmacists were conducted at Qatar University. A topic guide developed by study investigators. Discussions were audio-recorded and transcribed verbatim. Coded data was discussed and potential themes were identified. Data coding and analysis was supported by NVivo 11 software. Results were analyzed using framework analysis.

**RESULTS:** Two major themes relating to gaps between Infectious Diseases (ID) education and actual practice with regards to AMS training were identified throughout the discussions and associated recommendations made to improve: 1) ID module content and delivery; 2) ID knowledge and skills application. Two major themes emerged with regards to pharmacists' perceptions of AMS roles in hospital environments: 1) Impact of pharmacist's interventions on decision making as an antimicrobial steward; 2) Continuing professional development programming.

**CONCLUSION:** Students are with the basic knowledge and skills related to ID. However, gaps exist between AMS education and actual needs for clinical practice mainly related to perceived deficiencies in ID course content, challenges to information retention, and lack of relevant experiential training opportunities. Alumni also reiterated pharmacists' importance of their role as AMS team members. There is a need to align continuing education for health professionals with realities of practice.

**126. Effects of exercise and sleep on perceived stress among pharmacy students** *Abigayle Campbell, BS Psychology, Pharm.D. Candidate*, Sarah J. Barnes, Pharm.D. Candidate, G. Blair Sarbacker, Pharm.D., Nancy A. Taylor, R.Ph; Presbyterian College School of Pharmacy, Clinton, SC

**INTRODUCTION:** Stress on pharmacy students can be multi-factorial. Exercise has been shown to reduce stress; therefore, it would seem that if applied, it should lessen stress in pharmacy students. Sleep has also been shown to decrease stress and improve cognitive performance. To our knowledge no studies have specifically found correlation among exercise, sleep, and stress of pharmacy students.

**RESEARCH QUESTION OR HYPOTHESIS:** To evaluate the association between sleep and exercise on perceived stress in pharmacy school students.

**STUDY DESIGN:** Observational electronic survey

**METHODS:** First, second, and third year pharmacy students from Presbyterian College School of Pharmacy received an electronic survey evaluating the amount of time spent exercising, types of exercise performed, amount of sleep, and the perceived stress scale. The perceived stress scale was used to assess each participant's perception of stress in the previous month. The participants scores' were totaled and grouped based on the participants' exercise, sleep, sex, race, graduating class, and age.

**RESULTS:** The survey response rate was 49.5% (94/190) for eligible pharmacy students (27 first year students, 27 second year students, and 40 third year students). It was found that the mean perceived stress scale score was higher in the pharmacy students compared to the general United States population. There was no association between perceived stress and either age, race, sex, year of pharmacy school, exercise per day, exercise per week, or in those who exercise and those who do not. However, those who slept at least seven hours a night versus those who slept six or less had a significantly lower perceived stress scale score ($p = 0.0184$).

**CONCLUSION:** Pharmacy students who sleep at least seven hours per night have a lower stress level compared to those who get less sleep.

**127. Student pharmacists self-perceived confidence in communication skills with healthcare practitioners before and after a seminar course** *Kimberly Barefield, Pharm.D.*[1], Caroline Champion, Pharm.D.[1], Brent Rollins, R. Ph., Ph.D.[2]; [1]School of Pharmacy, Philadelphia College of Osteopathic Medicine – Georgia Campus, Suwanee, GA [2]School of Pharmacy, Philadelphia College of Osteopathic Medicine-Georgia Campus, Suwanee, GA

**INTRODUCTION:** Competent pharmacy practice requires proficiency in communicating pharmacotherapy information, literature, and recommendations to healthcare professionals. Given the limited research on how these skills are taught, a seminar course in the third year of the curriculum designed to strengthen the above skills and abilities was evaluated.

**RESEARCH QUESTION OR HYPOTHESIS:** Impact of a seminar course on students' self-perceived confidence in communication and drug literature evaluation skills?

**STUDY DESIGN:** A prospective, pre and post cohort survey design.

**METHODS:** Students were informed of study's intent with participation voluntary and not affecting their course grade. Students received the same survey at semester's beginning and end. The 26-question survey assessed self-perceived confidence in various specifics of communication and literature evaluation using a 5-point, Likert-type strongly disagree-strongly agree scale. In addition, demographic information and students' previous experience and current internship experience was collected. Descriptive statistics and paired and Student's t-test were used to assess the research question and comparisons based on student demographics.

**RESULTS:** Sixty-eight of a possible 91 students (75% response rate) completed both the pre and post survey. The remaining students

either did not participate or only filled out one of the two surveys. Overall, students slightly agreed they were confident in their communication and literature evaluation skills in the pre-course evaluation, with communicating drug interactions as the least confident area. Post-course, they were significantly more confident in all but four of 20 measured areas. By comparison, there was no statistically significant difference between any measured demographic (gender, age, previous degree, intern experience, and course grade).

**CONCLUSION:** The seminar course resulted in a positive change in students' perception of confidence to communicate with healthcare professionals and ability to evaluate drug literature.

**128. Impact of naloxone training on healthcare students' comfort level and ability to adequately counsel patients on bystander naloxone administration** *Sara Kjerengtroen, BS*[1], Crystal Kuzyk, BS[1], Catherine Derington, Pharm.D.[2], Shaun Gleason, Pharm.D., MGS[2], Dana Hammer, Ph.D., RPh[3], Megan Thompson, Pharm.D.[3]; [1]Skaggs School of Pharmacy and Pharmaceutical Sciences, University of Colorado, Aurora, CO [2]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO [3]Department of Experiential Services, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

**INTRODUCTION:** Since 2002 the number of opioid-related deaths in the United States has increased five-fold. There is currently no standardized naloxone training for healthcare students; however, the implementation of standing-orders has increased non-prescription naloxone access, and students will inevitably provide life-saving patient education to combat the opioid epidemic.

**RESEARCH QUESTION OR HYPOTHESIS:** How does naloxone training for healthcare students impact their ability, understanding, and comfort level when counseling patients on bystander naloxone administration?

**STUDY DESIGN:** Anonymous pre- and post-intervention surveys.

**METHODS:** Interprofessional healthcare students from the University of Colorado were invited to attend a hands-on naloxone training led by pharmacy students in early 2018. Training elements included standing-order naloxone, naloxone formulations and administration, responding to an opioid overdose, and patient counseling. Students completed a nine-question pre- and post-survey to assess students' comfort level with their training and ability to counsel on bystander naloxone administration, standing-order naloxone, and risk-benefit profile of bystander naloxone administration using a four-point Likert scale. Responses were dichotomized to agree or disagree. The primary endpoint was the proportion of students who felt adequately trained pre- and post-intervention. Secondary endpoints included understanding of standing-order naloxone and self-reported comfort level when counseling patients on naloxone. Descriptive statistics were conducted on survey responses.

**RESULTS:** Of 105 students who attended the trainings, 92 and 66 completed pre- and post-surveys, respectively. Students who affirmatively answered they were adequately trained to counsel patients on naloxone administration increased from 18.5% to 97.0% post-training. Students' understanding of standing-order naloxone increased from 80.4% to 100% post-training. Students' comfort level for counseling patients on naloxone administration improved from 27.1% to 97.0% post-training.

**CONCLUSION:** This study demonstrated a hands-on naloxone training session considerably improves healthcare students' ability, understanding, and comfort level to counsel patients on bystander naloxone administration. Professional schools should consider including standardized naloxone training for students.

**129. Utility of a co-curricular medicinal garden activity in achieving cape domains 3 and 4** *Julie Kalabalik, Pharm.D., BCPS, BCCCP*[1], Malgorzata Slugocki, Pharm D[2], Ayse Elif Ozdener, Pharm D, BCACP, CDE, AAHIVP[2], Anna Dushenkov, BS Pharm, Pharm.D., BCPS[1], Maria Leibfried, BS, Pharm.D., BCNSP[3], Lillian Rozaklis, Ph.D.[1], Ligia Westrich, Ph.D., RPh[3]; [1]Division of Pharmacy Practice, FDU School of Pharmacy and Health Sciences, Florham Park, NJ [2]Fairleigh Dickinson University School of Pharmacy and Health Sciences, Florham Park, NJ [3]Pharmacy Practice, Fairleigh Dickinson University School of Pharmacy and Health Sciences, Florham Park, NJ

**INTRODUCTION:** Educating patients about natural products is paramount (ACCP White Paper on Natural Products). A co-curricular medicinal garden activity was developed to address CAPE domains 3 and 4, which were identified as curricular gaps. First professional year students opted to create medicinal plant handouts, plant assigned species, and educate peers, faculty, and patients in a local transitional housing program.

**RESEARCH QUESTION OR HYPOTHESIS:** To determine usefulness of a co-curricular medicinal garden activity in achieving CAPE domains 3 and 4.

**STUDY DESIGN:** Prospective observational cohort study

**METHODS:** Forty-two students self-selected to participate in the activity and were divided into 8 groups. Each group was assigned one medicinal plant for which they created 2 handouts, one for patients and one for healthcare professionals. Faculty evaluated handouts and presentations using a rubric that mapped each element of the activity to specific outcomes and objectives within CAPE domains 3 and 4. SMOG readability test was used to estimate the handout reading level. Students answered one perception question on cultural awareness in a pre-post survey. Data were analyzed using descriptive statistics and paired-samples t-test.

**RESULTS:** Based on the rubric, 100% of students met CAPE objectives 3.6.8 and 3.2.4. All patient handouts demonstrated observable decrease of 3.5 reading grade levels compared to healthcare professional handout (3.2.5). Over 90% of students demonstrated professionalism (4.4.4) and communicated clearly (3.6.5). A statistically significant difference in agreement rating mean was detected after the activity compared to before the activity ($4.27 \pm 0.83$ vs. $3.81 \pm 1.12$) for the perception question ($p=0.006$).

**CONCLUSION:** This co-curricular medicinal garden activity facilitated student achievement of aforementioned outcomes and objectives of CAPE domains 3 and 4. Future delivery of this activity will focus on

improving student attainment of CAPE objective 3.2.5 and incorporating 3.2.6 through student-generated audience assessment.

**130. Enhancing student knowledge of medicinal plants through a co-curricular medicinal garden activity** *Julie Kalabalik, Pharm.D., BCPS, BCCCP*[1], Maria Leibfried, BS, Pharm.D., BCNSP[2], Malgorzata Slugocki, Pharm D[3], Ayse Elif Ozdener, Pharm D, BCACP, CDE, AAHIVP[3], Anna Dushenkov, BS Pharm, Pharm.D., BCPS[1], Lillian Rozaklis, Ph.D.[1], Ligia Westrich, Ph.D., RPh[2]; [1]Division of Pharmacy Practice, FDU School of Pharmacy and Health Sciences, Florham Park, NJ [2]Pharmacy Practice, Fairleigh Dickinson University School of Pharmacy and Health Sciences, Florham Park, NJ [3]Fairleigh Dickinson University School of Pharmacy and Health Sciences, Florham Park, NJ

**INTRODUCTION:** The role of pharmacists in educating patients on natural products is recognized in the ACCP White Paper on Natural Products and Appendix 1 of ACPE Standards 2016. Co-curricular learning is integral to pharmacy education and enhances the didactic curriculum. A co-curricular medicinal garden activity was developed to provide students with an opportunity to further increase their knowledge gained from a self-care integrated pharmacotherapy course in the first professional year.

**RESEARCH QUESTION OR HYPOTHESIS:** To determine usefulness of a co-curricular medicinal garden activity in increasing student knowledge of medicinal plants.

**STUDY DESIGN:** Prospective pre-post cohort study

**METHODS:** Forty-two students self-selected to participate in the activity and were divided into 8 groups. Each group was assigned one medicinal plant for which they created a healthcare professional handout and presented to faculty and peers. Students answered 16 knowledge-based questions before and after presentations. Responses were analyzed using paired-samples t-test, exact McNemar's test, and descriptive statistics.

**RESULTS:** Thirty-eight students (90.5%) completed both pre and post tests. The percentage of students who answered at least 14 of 16 questions correctly increased (2.4% pre vs. 42.1% post ($p<0.001$). There was a statistically significant increase in the test mean after the activity compared to before the activity ($79.4\pm14.3$ vs. $69.8\pm11.0$; $p<0.001$). The percentage of correct responses increased numerically in 12 of 16 questions, 3 of which were statistically significant. Four of 16 questions showed minimal non-significant decrease in correct responses.

**CONCLUSION:** Knowledge gains from this co-curricular medicinal garden activity are evident based on significant improvement in mean test scores. Due to the success of this program, the activity will be expanded to include the entire first year student cohort.

**131. Description and assessment of a pilot interprofessional drug compatibility simulation.** *Elizabeth Covington, Pharm.D.*[1], Jill Hightower, MSN, RN[2], Greg Gorman, Ph.D.[1]; [1]McWhorter School of Pharmacy, Samford University, Birmingham, AL [2]Ida Moffett School of Nursing, Samford University, Birmingham, AL

**INTRODUCTION:** Interprofessional education/collaboration (IPEC) is a core component of pharmacy curricula. As such, it is important to assess the efficacy of simulations designed to increase IPEC competencies. An interprofessional simulation of pharmacy and nursing students was designed to explore drug compatibility using actual IV tubing and pumps.

**RESEARCH QUESTION OR HYPOTHESIS:** To evaluate the effects of an interprofessional drug compatibility simulation on student growth in IPEC competencies.

**STUDY DESIGN:** Students completed an anonymous, electronic pre- and post-simulation event survey via Qualtrics.

**METHODS:** Pharmacy and nursing students were invited to participate in this voluntary simulation, with a pre-survey prior to participation and an identical post-survey immediately following. The survey was an established 16-item, 5-point Likert scale survey based on IPEC competencies. Students worked together to accomplish the simulation event analyzing drug compatibility between two commonly co-administered medications – vancomycin and piperacillin/tazobactam – at a variety of different concentrations and different IV tubing lengths. IV medications were prepared by pharmacy students, IV pumps were primed and programmed by nursing students, and students collaborated to collect and analyze samples using pH, turbidity, high performance liquid chromatography (HPLC), and visual inspection. Descriptive statistics were performed on survey data.

**RESULTS:** Five students participated in the event with a survey response rate of 100% (5/5 students). The pre- versus post-simulation survey data suggest improved self-reported competence in the interprofessional interaction and values domains. The average pre-simulation interaction domain score was 4.45 compared with a post-simulation score of 4.825. The average pre-simulation values domain score was 4.675, compared with a post-simulation score of 4.85. Survey questions with the largest pre-post change were related to engaging other health professionals to problem solve and constructively manage disagreements.

**CONCLUSION:** This pilot IPE simulation event showed an improvement in the IPEC domains of interaction and values and warrants further evaluation on a larger scale.

**132. Examining job availability and required qualifications for critical care pharmacy positions** *Kevin VanMaldeghem, Bachelor of Science*[1], Nancy Borja-Hart, Doctor of Pharmacy[2]; [1]College of Pharmacy, University of Tennessee Health Science Center, Nashville, TN [2]Department of Clinical Pharmacy and Translational Science, University of Tennessee Health Science Center College of Pharmacy, Nashville, TN

**INTRODUCTION:** It is often implied that to be a clinical pharmacy specialist some form of advanced training is required. Pharmacists who wish to be a critical care pharmacy specialist have the opportunity to further their knowledge by completing a PGY2 in critical care or pursue board certification in critical care pharmacy (BCCCP).

**RESEARCH QUESTION OR HYPOTHESIS:** To identify what qualifications employers are looking for in a critical care pharmacy specialist by examining job postings.

**STUDY DESIGN:** Descriptive, retrospective evaluation.

**METHODS:** To locate jobs, the job search engine Indeed was used. The search took place in January 2018 and the search phrase "critical care pharmacist" was used. Jobs were included if they were full time positions taking place exclusively in a critical care setting (ICU, CCU, etc). Jobs were excluded if they were part time positions or did not specify a critical care specialist.

**RESULTS:** A total of 1692 results were returned. Of those, 33 met the inclusion criteria. 10 required a Doctor of Pharmacy degree. 15 required completion of a PGY1 pharmacy residency or equivalent experience of 3 years in practice. Of those 15, six of them preferred completion of a PGY2 residency or equivalent experience of 5 years in practice. 11 required completion of a PGY2 residency or equivalent experience. Board certification was only required for 2 positions, while another singular position required board certification within 1 year of hire. However, 14 of 34 jobs did prefer board certification.

**CONCLUSION:** Experience was the major requirement when it came to job postings for critical care pharmacy positions. Completion of a PGY1 residency was the minimum for most job postings. Board certification may be appealing to employers, but it is not a minimum requirement at this point for most critical care pharmacy jobs.

**133. Training pharmacy students to use medical interpreters: a prospective, randomized, controlled trial** *Cole Smith, Doctor of Pharmacy*; School of Pharmacy, West Virginia University, Morgantown, WV

**INTRODUCTION:** Little is known about how well pharmacy schools prepare their students in utilizing medical interpreters when caring for patients with limited English proficiency (LEP).

**RESEARCH QUESTION OR HYPOTHESIS:** An instructive session on interpreter utilization will improve competence and confidence of third-year pharmacy (P3) students when using a professional medical interpreter.

**STUDY DESIGN:** This was a randomized, prospective, blinded, controlled trial. Students were randomly divided in a 1:1 fashion into either a test group who received a one-hour didactic instructive lesson on utilizing medical interpreters or a control group who did not receive training.

**METHODS:** All students underwent a medication reconciliation simulation involving an LEP patient while utilizing an in-person interpreter. Students completed a confidence level survey using a 5-point Likert scale and were formally evaluated on competence using the Faculty Observer Rating Scale (FORS), a validated interpreter utilization scoring tool. The confidence level survey was completed twice by the test group (before and after the didactic training) and once by the control group. For the primary outcome of the difference in mean total FORS score between groups, a two-sided t-test was used assuming equal variance. For the secondary outcome, descriptive statistics were used to analyze the difference of student self-assessed confidence level for the test group before and after completing a didactic training session as well as compared to the control group.

**RESULTS:** The control group (n=18) had an average FORS score of 38.4 $\pm$ 10.7, compared to 44.2 $\pm$ 8.4 with the test group (n=16) ($p=0.0935$). The overall median on the confidence survey was 3 for the control group, 2 for the pre-didactic training test group, and 4 for the post-didactic training test group.

**CONCLUSION:** This study suggests that a one hour interpreter training session improved P3 students' confidence and ability to utilize an interpreter while caring for an LEP patient.

**134. Incorporating team-based learning during introductory pharmacy practice experiences** *Jonathan Cho, Pharm.D., BCPS*, Fadi Alkhateeb, BSPharm, MBA, Ph.D., FAACP, Lane Brunner, Ph.D., R.Ph.; College of Pharmacy, The University of Texas at Tyler, Tyler, TX

**INTRODUCTION:** Introductory pharmacy practice experiences (IPPEs) are essential learning experiences in the Doctor of Pharmacy curriculum. Various approaches to optimize pharmacy student learning during IPPEs have been employed, but changes in pedagogical strategies, such as the use of team-based learning (TBL), are not as vast. To our knowledge, this is the first study to incorporate formalized TBL-based activities in pharmacy experiential education.

**RESEARCH QUESTION OR HYPOTHESIS:** What are the perspectives of pharmacy students regarding the use of TBL pedagogy during IPPEs?

**STUDY DESIGN:** A cross-sectional study.

**METHODS:** An electronic survey was distributed via e-mail to 15 third year pharmacy students enrolled in TBL-based IPPEs during Spring 2018. Data related to students' demographic information, level of confidence of performing pharmacist-related duties, and perceptions of TBL were collected. Aside from demographic information, all responses were formatted via a 5-point Likert scale where 1 = strongly disagree/not at all confident and 5 = strongly agree/extremely confident.

**RESULTS:** A total of 13 pharmacy students completed the survey, providing a response rate of 86.7%. Greater than 92% of pharmacy students either agreed or strongly agreed that TBL activities better prepared them to work collaboratively in teams (mean Likert score = 4.7), prepared them to communicate effectively (4.2), reinforced their individual learning (4.5), and allowed them to understand other's thought processes (4.5). Additionally, 84.6% of pharmacy students either agreed or strongly agreed that TBL-based IPPEs better prepares them for advanced pharmacy practice experiences (4), 76.9% preferred TBL-based IPPEs over non-TBL based IPPEs (4.1), and 76.9% believed TBL should continue to be incorporated during experiential experiences (4.1).

**CONCLUSION:** Pharmacy students perceive formalized TBL pedagogy to be beneficial during their experiential learning experiences and prefer TBL-based IPPEs over non-TBL based IPPEs. Different pedagogical methods, such as team-based learning, can be considered in settings outside of the didactic pharmacy curriculum.

**135. Medical student and resident perceptions of ambulatory pharmacy before and after one year of interprofessional collaboration in an adult medicine evening clinic** *Amy Yanicak, Pharm.D., MPH*[1], Karen

White, Pharm.D.[2]; [1]Department of Pharmacy Practice, University of Washington, Charlotte, NC [2]Department of Pharmacy Practice, University of Washington, Seattle, WA

**INTRODUCTION:** Medical students and residents interact with pharmacy students and pharmacists as a part of interprofessional education requirements at colleges of medicine but it is unknown what their interactions are with clinical ambulatory care (clinic-based) pharmacists or how this impacts their perceptions of pharmacists.

**RESEARCH QUESTION OR HYPOTHESIS:** At the end of a year-long and weekly clinical experience of medical students working with a clinical pharmacist, would they have greater confidence in an ambulatory care pharmacist's abilities and assign pharmacists more drug-related responsibilities?

**STUDY DESIGN:** Single-site, single-arm pre-post interventional study

**METHODS:** 12 item survey was developed with 2 demographic questions, 9 likert scale questions, and one open-ended question. It was given to medical students and their resident preceptors during the beginning (August 8, 2017) and end (May 22, 2018) of a medical student year-long evening clinic. Data was collected and analyzed descriptively.

**RESULTS:** 8 pre-surveys and 9 post-surveys were completed. All 8 pre-survey respondents had previously worked with a pharmacist in varied settings. At the beginning of the year-long evening clinical pharmacist consult service experience, all respondents had an average or above average understanding of services pharmacists provide in ambulatory care. 3 out of 8 stated pharmacists had no responsibility in diagnosis on a 4-point likert scale. At the end of the evening clinic experience, 8 respondents felt pharmacists had some responsibility in diagnosis, all felt pharmacists had most responsibility in medication counseling, and they were more likely to consult a pharmacist about patients in the clinic.

**CONCLUSION:** These results indicate that many medical students and residents have had prior exposure to working with a pharmacist and have an understanding of a pharmacist's role and contributions to patient care. After the evening clinic experience, they may have had some changed perspectives regarding ambulatory care pharmacy, but further research needs to be done to determine specific areas of changed perspectives.

**136. The pedagogical utility in student pharmacogenomics testing, results, and counseling** *Amy Liu, BS*[1], Jose Tinajero, BS[1], Sam Oh, Ph.D., MPH[2], Tejal Desai, Ph.D.[3], B. Joseph Guglielmo, Pharm.D.[1], Su Guo, Ph.D.[3], Alan Wu, Ph.D.[4], Esteban Burchard, MD, MPH[2]; [1]School of Pharmacy, University of California, San Francisco, San Francisco, CA [2]Medicine, University of California, San Francisco, San Francisco, CA [3]Bioengineering and Therapeutic Sciences, University of California, San Francisco, San Francisco, CA [4]Laboratory Medicine, University of California, San Francisco, San Francisco, CA

**INTRODUCTION:** The low presence of pharmacogenomics-related education in professional school curricula may impact the acceptance of precision medicine in clinical practice. Previous studies have shown positive effects of integrating personalized pharmacogenetic testing on educating future healthcare providers. However, the utility of a single interactive classroom session remains to be determined.

**RESEARCH QUESTION OR HYPOTHESIS:** How do professional students' knowledge and attitudes of applied pharmacogenomics change when personal and anonymized population results are revealed during a classroom session?

**STUDY DESIGN:** Forty-eight first-year UCSF School of Pharmacy doctoral (Pharm.D.) students completed online surveys before and after pharmacogenetic results "Reveal Day" in a required pharmacogenomics course.

**METHODS:** Through Research Electronic Data Capture software, an anonymized baseline survey assessed students' knowledge and attitudes of pharmacogenomics using a 5-point Likert scale. All subjects consented to direct-to-consumer (DTC) pharmacogenetic testing with 23andMe and enrollment in Test2Learn application programming interface (API) for results reporting. After receiving personal results and revelation of anonymized population frequencies in the classroom on Reveal Day, students participated in clinical counseling exercises centered around common allelic variants for drug-metabolizing enzymes (e.g. cytochrome P450 2D6, 2C19) and were surveyed again. Survey results were compared using a Wilcoxon signed-rank test. All tests were two-sided and p-value≤0.05 was considered statistically significant.

**RESULTS:** We found statistically significant improvement in students' knowledge (0.13 Likert points, p-value=0.0114), but not for attitudes (0.22 Likert points, p-value=0.1105), of pharmacogenomics following DTC pharmacogenetic testing, API results reporting, and clinical counseling exercises.

**CONCLUSION:** Our findings highlight that applied pharmacogenomics education led to measurable changes in Pharm.D. students' knowledge of pharmacogenomics and had a modest effect on students' attitudes toward pharmacogenomics after a single interactive Reveal Day. This supports previous findings over a 10-week pharmacogenomics course. Future studies will investigate the long-term persistence of this effect.

**137. Novel interprofessional education including a community pharmacy and clinic or emergency room** *Mary Beth O'Connell, Pharm.D.*[1], Stephanie Gilkey, MS, PA-C[2], Amy Derecyzk, MS, PA-C[3], Joseph Fava, Pharm.D.[1], Constance Burke, MS, PA-C, JD[3]; [1]Pharmacy Practice Department, Wayne State University, Eugene Applebaum College of Pharmacy and Health Sciences, Detroit, MI [2]Physician Assistant Program, University of Michigan-Flint, Flint, MI [3]Physician Assistant Program, University of Detroit Mercy, College of Health Professions, Detroit, MI

**INTRODUCTION:** Interprofessional education (IPE) and care (IPC) are important but rarely integrated into community pharmacies, sites important to transitions of care.

**RESEARCH QUESTION OR HYPOTHESIS:** Will IPE with pharmacy (Pharm.D.) and physician assistant (PA) student teams increase IPC attitudes and skills?

**STUDY DESIGN:** Pre-post survey and skill assessment

**METHODS:** Twenty fourth-year Pharm.D. and second-year PA student teams practiced in community pharmacy (2 days) and clinic or emergency room (2 days). Structured IPC curriculum and team self-evaluation occurred daily. Outcomes – anonymously completed pre-post validated Attitudes Toward Healthcare Teams and investigator-created post-program surveys, and pre-post team observed structured clinical encounters (TOSCE with modified McMaster-Ottawa assessment tool, observer training). Descriptive and T-tests performed (SPSS, significance ≤0.05). IRB exempted.

**RESULTS:** IPC attitudes were positive before program (means 4.5-5.6 with 6 high scale). Only significance change was more students felt IPC was more efficient (p=0.017). Pharm.D. and PA students overall had similar views. Differences included Pharm.D. students became more positive about physicians legally responsible for teams (change +0.4 vs. -1.1 PAs; p=0.03) and patients better prepared for discharge (change +0.5 vs. -0.4 PAs; p=0.02). Students felt IPE and IPC increased patient (97%) and healthcare communication skills (100%), understanding of patient problems (97%), interventions (84%), and future IPC skills (95%); and decreased errors (97%). Most students (91%) felt this IPE was worthwhile and should continue (71%). Student performance (pre/post TOSCE means + standard deviation with 5 high scale; N=10 teams) significantly increased communications (2.9+0.9 vs. 4.1 +0.7, p=0.028), collaboration (2.3+0.9 vs. 4.0+1.1, p=0.011), roles and responsibilities (2.0+0.7 vs. 4.0+1.1, p=0.011), patient-centered care (2.6+0.8 vs. 4.4+0.7 p=0.01), conflict management (2.4+1.1 vs. 3.8 +1.0 p=0.024), and team functioning (2.3+0.8 vs. 3.7+1.2, p=0.024).

**CONCLUSION:** Real-world IPE/IPC including a community pharmacy improved Pharm.D. and PA students' skills, which they felt improve healthcare quality and safety. IPC attitudes positive. TOSCEs captured IPC skill development.

**138. Impact of an elective applied improvisation course on student pharmacists' patient communication skills** *Anne Graff LaDisa, Pharm.D., BCPS*, Sarah Ray, Pharm.D., BCPS, FAPhA; Department of Pharmacy Practice, Concordia University Wisconsin School of Pharmacy, Mequon, WI

**INTRODUCTION:** Excellent communication skills are essential in clinical pharmacy practice. Applied improvisation (AI) offers an innovative strategy to strengthen students' communication skills. Studies have reported AI use in medical education and required pharmacy student courses. Conversely, there is little data from elective courses for pharmacy students using AI in an active learning, workshop format to enhance communication skills.

**RESEARCH QUESTION OR HYPOTHESIS:** Students who completed an AI course will demonstrate and perceive superior communication during a simulated patient encounter (SPE) compared to students who have not completed an AI course.

**STUDY DESIGN:** Students' communication skills during SPEs were evaluated via rubric in a double-blinded fashion. Students completed a communication skills perceptions survey. AI course student ratings and perceptions were compared to students not completing the AI course.

**METHODS:** Students participated in an SPE in an Applied Patient Care course which required skilled communication use. Students' communication skills during the encounter were evaluated by an investigator using an internally validated rubric. Students' ability to listen well, use empathetic responses, and display confidence and spontaneity were evaluated during the encounter. Students were asked to complete a Likert scale survey assessing their perception of their communication skills during the encounter.

**RESULTS:** Eight students who completed the AI course and 91 students who did not complete the AI course were evaluated in the SPE. There was no statistical difference between AI and non-AI course students' performance, (p=.703 and .596 for listening/responding and spontaneity/confidence respectively). Students' perceptions of their skills in the AI group (n=5) and non-AI group (n=50) were not statistically significant, (p=.399 for overall communication score).

**CONCLUSION:** Students completing the AI course did not demonstrate or perceive superior communication during the SPE compared to students not completing the AI course. The small number of students in the intervention group hindered the ability to detect a significant difference.

**139. Global health learning outcomes and competencies among pharmacy students** *David Steeb, Pharm.D., MPH*[1], Monica L. Miller, Pharm.D., MS[2], Ellen Schellhase, Pharm.D.[2], Jodie Malhotra, Pharm.D.[3], Stuart T. Haines, Pharm.D.[4]; [1]UNC Eshelman School of Pharmacy, Chapel Hill, NC [2]Department of Pharmacy Practice, Purdue University College of Pharmacy, West Lafayette, IN [3]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy, Aurora, CO [4]Pharmacy Practice, The University of Mississippi School of Pharmacy, Jackson, MS

**INTRODUCTION:** While two thirds of US schools/colleges of pharmacy offer an international APPE, there is limited data regarding the impact of these experiences. The study's purpose was to assess the learning outcomes and global health competencies of student pharmacists who participate in international APPEs.

**RESEARCH QUESTION OR HYPOTHESIS:** International APPE rotation students will have larger levels of self-perceived growth regarding global health than those not participating in international APPE rotations.

**STUDY DESIGN:** A mixed-methods design using a retrospective pre-post questionnaire.

**METHODS:** Fourth year student pharmacists (n=71) participating in an international APPE were matched with peers not completing an international APPE (n=71) based on age and rotation schedule. Each cohort took a retrospective pre-post questionnaire assessing self-perceived ability to meet thirteen basic global health competencies as defined by the Consortium of Universities for Global Health using a 5-point Likert scale. The international APPE cohort answered additional open-ended questions regarding knowledge, skills, and attitudes gained or enhanced from their international rotation. Survey data within each cohort was analyzed with SPSS using the Wilcoxon signed

rank test and the Mann-Whitney U test for differences between cohorts. Open-ended data was coded and categorized into themes.

**RESULTS:** Among students who completed an international APPE, the pre-post scores for all thirteen basic global health competency statements significantly increased (P<0.05). The largest positive growth changes for the international APPE cohort against the non-international APPE cohort were for describing major public health efforts to reduce disparities in global health (2.38 to 3.45 vs. 2.35 to 2.52, p<0.001) and the roles of major entities influencing global health (2.79 to 3.93 vs. 2.79 to 3.07, p<0.001). Major themes coded regarding knowledge, skills, and attitudes gained were limited resource utilization, communication, and cultural appreciation, respectively.

**CONCLUSION:** International APPE rotations strengthen basic global health competencies and provide an opportunity for impactful learning.

**140. Increasing the odds of matching: implementation of a residency advising program** *Leigh Gravatt, Pharm.D.*[1], Krista L. Donohoe, Pharm. D.[2], Benjamin Van Tassell, Pharm.D.[3], Abigale Matulewicz, Pharm.D.[4], Lauren Pamulapati, Pharm.D.[4], Lauren Caldas, Pharm.D.[5], Emily Peron, Pharm.D., MS[3]; [1]Department of Pharmacotherapy and Outcomes Sciences, Virginia Commonwealth University School of Pharmacy, Richmond, VA [2]Virginia Commonwealth University, Richmond, VA [3]School of Pharmacy, Virginia Commonwealth University, Richmond, VA [4]Department of Pharmacotherapy and Outcomes Sciences, VCU School of Pharmacy, Richmond, VA [5]Department of Pharmacotherapy & Outcomes Science, Virginia Commonweatlh University School of Pharmacy, Richmond, VA

**INTRODUCTION:** The American College of Clinical Pharmacy (ACCP) has advocated that a postgraduate year 1 (PGY1) residency should be required for all pharmacists participating in direct patient care activities by 2020. Currently the number of residency applicants exceeds the number of residency slots. The Residency Advising Program (RAP) was developed and initiated in Fall 2015 at Virginia Commonwealth University (VCU) School of Pharmacy (SOP). Fourth year pharmacy students voluntarily enroll in the program which includes faculty mentorship, a podcast series explaining the residency and/or fellowship application process, mock video interviews, and Phase II match assistance.

**RESEARCH QUESTION OR HYPOTHESIS:** Does enrollment in the RAP at VCU increase the odds of students achieving a PGY1 residency or fellowship?

**STUDY DESIGN:** This was a retrospective analysis of residency match rates and fellowship placements among fourth year students at VCU from 2016-2018.

**METHODS:** Students who were participating in the National Pharmacy Match at VCU were retrospectively divided into two groups-students who enrolled in the RAP versus those who did not. PGY1 match rates and fellowship placements were compared between the two groups. Descriptive statistics and chi-square were used to compare the two groups.

**RESULTS:** A total of 131 students participated in both the RAP and match process versus 40 students who participated in the match alone. The match percentage was significantly higher in students who participated in the RAP versus students who had not (89.19% versus 58.33%, p<0.001). Students had significantly higher odds of matching with a PGY1 residency or placing with a fellowship if they had enrolled in this program (OR 4.1, CI 1.87-9.01).

**CONCLUSION:** Students at VCU SOP are more successful at obtaining PGY1 residency or fellowship by participating in the RAP.

**141. Evaluation of knowledge of warfarin management in a family medicine residency clinic** *Amy Robertson, Pharm.D.*[1], Raghuveer Vedala, MD[2], Jessica Kieffer, MD[2], Jeena George, MD[2], Kari Nilsen, Ph.D.[3]; [1]Department of Pharmacy Practice, University of Kansas School of Pharmacy, Wichita, KS [2]Wesley Family Medicine Residency Program, Wichita, KS [3]Department of Family and Community Medicine, University of Kansas School of Medicine, Wichita, KS

**INTRODUCTION:** Warfarin management is challenging due to its narrow therapeutic window. Residency training clinics present additional challenges in warfarin therapy management. There is limited data regarding knowledge and management of warfarin in residency training facilities. Appropriate warfarin management is necessary to minimize adverse effects. Therefore, it is essential to ensure resident physicians understand and apply the principles of guideline-based warfarin management to clinical practice.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the impact of pharmacist-led education on resident physician knowledge and comfort regarding warfarin management?

**STUDY DESIGN:** This was a quality improvement study conducted at a family medicine residency clinic.

**METHODS:** Participating resident physicians were given a baseline questionnaire regarding generally accepted guidelines and best practices for management of warfarin therapy. Residents' comfort level of treating patients on warfarin was also assessed using seven questions on a 5-point Likert scale. Following this, residents were given a 45-minute pharmacist-led didactic lecture. Residents completed the same questionnaire immediately following the lecture, and again one month after the lecture to assess knowledge retained and changes in comfort level. The primary outcome was the difference in knowledge scores between pre- and post-didactic questionnaires. Secondary outcomes included the difference in comfort level scores and retention of knowledge. Descriptive analysis, exact sign tests, and paired-sample t-tests were used to assess study aims, as appropriate.

**RESULTS:** Thirteen out of 26 potential residents (50%) attended the didactic session. Five of seventeen questions assessing resident knowledge had significant positive differences in number of correct responses. Analysis revealed a significant change in knowledge as a result of the didactic session [t(303)=14.35, p<0.0001], which was sustained after one month [t(26)=-0.71, p=0.49]. There was a significant change in pre- and post-comfort levels [t(12)=-4.42, p<0.001], which was sustained after one month [t(2)=-0.08, p=0.94].

**CONCLUSION:** Residents' knowledge of warfarin management was significantly improved after pharmacist-led education.

**142. Utilization of Desire2Learn and ExamSoft as examination administration platforms: pharmacy students' perspective** *Sam Harirforoosh, Pharm.D., Ph.D.*; Department of Pharmaceutical Sciences, East Tennessee State University, Johnson City, TN

**INTRODUCTION:** Pharmacokinetics is a four-credit hour course, offered to P2 students, with five examinations. Tests, consisting of multi-choice questions, are administered in class. Although most instructors in our school have implemented ExamSoft for test taking, we use Desire2Learn for pharmacokinetics exams.

**RESEARCH QUESTION OR HYPOTHESIS:** The objective of this study was to evaluate students' preference on the use of two platforms, Desire2Learn and ExamSoft, for the administration of exams.

**STUDY DESIGN:** An exploratory web-based survey.

**METHODS:** Student views on examination software usage were evaluated with three questions included in an anonymous summative survey conducted by the Academic Affairs office. A 5-point Likert scale (1-Strongly Disagree to 5-Strongly Agree) was utilized in the semester end survey. The local Institutional Review Board did not consider the current project as human subject research.

**RESULTS:** In a class of seventy-one students, a response of 28% was found for questions 1 and 2; while question 3 showed a 27% response rate. A vast majority of the respondents (95%) agreed or strongly agreed that the pharmacokinetics exams being administered through Desire2Learn "seemed like a good idea" (Question 1). A similar response (95%) was observed when asked whether they would recommend Desire2Learn usage for future pharmacokinetics exams (Question 2). In addition, 79% of the respondents agreed or strongly agreed that they prefer using Desire2Learn compared to ExamSoft for examinations (Question 3).

**CONCLUSION:** The results of this study showed that P2 pharmacy students preferred Desire2Learn over ExamSoft usage in general. However, due to low response rates, further research may be warranted to confirm these results.

**143. Pharmacy without borders: a US-Chinese global classroom** *Lindsey Edwards, Pharm.D. Candidate*[1], Li Yang, MS[2], Jeffery Cain, EdD[3], Rongsheng Zhao, Ph.D.[2], Frank Romanelli, Pharm.D., MPH[3], Melody Ryan, Pharm.D., MPH, FCCP, BCPS, BCGP[3]; [1]University of Kentucky College of Pharmacy, Lexington, KY [2]Department of Pharmacy, Peking University Third Hospital, Beijing, China [3]Department of Pharmacy Practice & Science, University of Kentucky College of Pharmacy, Lexington, KY

**INTRODUCTION:** An elective Global Classroom course was developed and implemented. It focused on exposing students to principles of healthcare in the American and Chinese cultures, as well as challenging students to apply those concepts across different cultures and health-belief systems. The course was comprised of six live lectures and 10 pre-recorded lectures. Each US student was paired with a Chinese student. Instant messaging applications were used for pair communication to facilitate group work during live sessions. At the conclusion of the course, pairs executed a presentation.

**RESEARCH QUESTION OR HYPOTHESIS:** Participation in the course will result in a higher Global Citizenship Scale (GCS) score.

**STUDY DESIGN:** Quasi-experimental pretest/posttest study.

**METHODS:** Students completed the GCS at the beginning and the conclusion of the course. A Likert-type scale ranging from strongly disagree (1) to strongly agree (5) assesses the global citizenship principles of social responsibility, global competence and global civic engagement. Student's paired t-test was used to compare the observed mean difference and calculate the p value.

**RESULTS:** Twenty-one students completed the pre-course survey and nine completed the post-course survey, allowing for nine sets of paired data. The pre-course GCS yielded a mean of $3.18 \pm 0.28$. The post-course GCS mean was $3.6 \pm 0.45$. The mean difference was a statistically significant average increase of $0.42 \pm 0.37$ ($p<0.01$).

**CONCLUSION:** The study found a statistically significant increase in GCS scores after completion of the course. Due to lack of return of the post-course survey, the sample size is small at nine students and is a limitation of the study. With the rapidly growing and changing technological world, people from across the globe are now more connected than ever before. Therefore, finding ways to improve global citizenship and cultural competency is paramount. The implementation of the Global Classroom seeks to foster these principles in students.

**144. Career preparation collaboration between two pharmacy schools: results from the TTUHSC-UNTHSC joint career fair** *Fahraj Ahmed, Pharm.D. Candidate*[1], Lydia Girgis, Pharm.D. Candidate[1], Lilliana Gonzales, Pharm.D. Candidate[1], Danh Nguyen, Pharm.D. Candidate[2], Sabrina Haj, Pharm.D. Candidate[2], Jennifer Suarez, Pharm.D. Candidate[2], Randy Martin, Pharm.D, BCCCP[2], Krystal Edwards, Pharm.D., FCCP, BCPS[1]; [1]School of Pharmacy, Texas Tech University Health Sciences Center, Dallas, TX [2]College of Pharmacy, University of North Texas Health Science Center, Fort Worth, TX

**INTRODUCTION:** Career preparation events are valued by students and institutions alike. There are many examples of successful jointly organized career events among schools. Collaboration between pharmacy schools is fairly common, particularly in experiential education and assessment. Despite these existing partnerships, literature is scarce when it comes to collaborative career events hosted between pharmacy schools.

**RESEARCH QUESTION OR HYPOTHESIS:** There is no difference in perception among students, vendors, and faculty about a career event collaboration between two schools.

**STUDY DESIGN:** Four surveys were developed and administered in Qualtrics during the TTU-UNT joint career fair. The surveys utilized Likert-based and free-response questions.

**METHODS:** The two-day career fair consisted of twelve workshops and interactive sessions along with a career expo. Students from both schools received pre- and post-surveys, while the faculty and vendors

received one post-survey. The primary objective was to evaluate students' pre- and post-career fair perceptions, with secondary objectives evaluating faculty members' and vendors' perceptions in this IRB approved research. Descriptive statistics along with Wilcoxon signed-rank and Fisher's exact tests were used for statistical analysis as appropriate using STATA software.

**RESULTS:** 63% of students found it beneficial to interact with the other school. 80% of UNT students found collaboration between schools more beneficial compared to 48% of TTU students (p = 0.034). 78% of non-first time vendors rated the collaborative event as positive, while 100% surveyed supported continuation of such events. Faculty members reported that collaboration between the two schools enhanced workshops (85%), review rooms (95%), mock interviews (100%), variety of vendors (84%), and overall quality of the event (89%). 90% of the faculty agreed that TTU and UNT should continue to offer these events.

**CONCLUSION:** Although the perception of students varied, the general consensus among students found it beneficial to interact with students from other schools. Both the faculty and the vendors overwhelmingly favored conducting future joint-events.

**145E. Development and evaluation of a general medicine elective course** *Alexa Carlson, Pharm.D., BCPS*[1], Margarita V. DiVall, Pharm.D., MEd, BCPS[2], Mark A. Douglass, Pharm.D.[3], Michael J. Gonyeau, BSPharm, Pharm.D., MEd, BCPS, FCCP[2], Jason Lancaster, Pharm.D., MEd[2], Stephanie Sibicky, Pharm.D., BCPS, CGP[4], Adam B. Woolley, Pharm.D., BCPS[5]; [1]Northeastern University – Bouvé School of Pharmacy, Boston, MA [2]School of Pharmacy, Northeastern University, Boston, MA [3]Northeastern University Department of Pharmacy Practice/ Boston Medical Center, Boston, MA [4]Northeastern University, Boston, MA [5]Northeastern University Department of Pharmacy Practice, Boston, MA

Presented at the American Meeting of the Amercian Association of Colleges of Pharmacy, Nashville, TN, July 15-17, 2017.

**146. Impact of a clinical pharmacy on-call program on pgy1 pharmacy residents** Nicole Coglianese, Pharm.D.[1], *Jennie Jarrett, Pharm.D., BCPS, MMedEd*[2]; [1]College of Pharmacy, University of Illinois at Chicago, Chicago, IL [2]College of Pharmacy; Department of Pharmacy Practice, University of Illinois at Chicago, Chicago, IL

**INTRODUCTION:** On-call programs are innovative learning opportunities within pharmacy residencies to assist residents in fostering critical thinking skills, communication skills, and clinical autonomy. The objective of this study is to determine the educational and professional impact of the University of Illinois at Chicago (UIC) on-call program on PGY1 pharmacy residency alumni.

**RESEARCH QUESTION OR HYPOTHESIS:** The UIC on-call program has high educational value for PGY1 pharmacy residents across multiple therapeutic knowledge areas and supports residents participating across multiple specialties with various types of health professionals.

**STUDY DESIGN:** Prospective, cross-sectional survey design

**METHODS:** A prospective, cross-sectional survey was conducted from March 1, 2018 to April 1, 2018 among residency alumni who participated in the UIC pharmacy residency on-call program between 2000 and 2017. The primary objective was to evaluate the educational impact of the on-call program including: value of the program, pharmacotherapeutic knowledge, and professional skills. Secondary outcomes included the professional impact of the on-call program on pharmacy residents such as career trajectory and interprofessional outcomes. Quantitative results were analyzed using descriptive statistics.

**RESULTS:** Ninety-five PGY1 pharmacy residency alumni responded to the electronic survey about the on-call program; response rate of 58.6%. Overall, alumni reported a high satisfaction (93/94; 98.9%) and positive perception (93/94; 98.9%) of the on-call program as a highly valuable component of the PGY1 residency program. PGY1 pharmacy residents reported participating in a variety of clinical practice activities across many specialties (ID, critical care, emergency medicine, and general medicine) while on-call. Lastly, the on-call program is a highly interprofessional experience allowing interactions with a variety of health care providers (physicians, nurses, pharmacists, and advance practice providers).

**CONCLUSION:** The UIC on-call program provides an overall positive experience for PGY1 pharmacy residents exposing them to a variety of pharmacotherapeutic knowledge areas while also strengthening their clinical skills. Furthermore, the UIC on-call program was reported to be a highly interprofessional experience.

**147. Impact of skills laboratory bonus assignment** *Jeanna Sewell, Pharm.D., BCACP*[1], Kristi Kelley, Pharm.D., FCCP, BCPS, CDE, BC-ADM[2], Pamela Stamm, Pharm.D., BCPS, BCACP, CDE, FASHP[1]; [1]Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Auburn, AL [2]Auburn University, Harrison School of Pharmacy, Birmingham, AL

**INTRODUCTION:** Students appear to be putting less effort into preparing for skills laboratory, therefore bonus assignments were implemented to improve student preparation.

**RESEARCH QUESTION OR HYPOTHESIS:** To determine student perception of benefit and impact of bonus assignments on student performance in a third professional year skills laboratory course.

**STUDY DESIGN:** Investigators conducted a retrospective analysis of the impact of bonus assignments offered in preparation for three laboratory activities: Idaho Plate Method (IPM) education, algorithm based insulin adjustment, and immunization recommendations utilizing vaccine schedules during a third professional year skills laboratory course.

**METHODS:** Activities were available for students to complete after the pre-laboratory lecture and prior to the laboratory activity. Impact was assessed by comparing relevant examination questions and objective structured clinical examination (OSCE) item scores between bonus assignment Completers and Non-completers. Students were asked about perceived helpfulness of the bonus activities on

preparation for lab. Exam and OSCE item scores were evaluated using t-tests. Descriptive statistics were used to assess student survey responses.

**RESULTS:** In 2016 and 2017, respectively, 43% and 36% completed IPM, 67% and 82% completed insulin, and 70% and 84% completed immunizations. Completer vs Non-completer average scores on relevant insulin and IPM exam items and relevant IPM and immunization OSCE items were not statistically different. Student evaluations from 2016 and 2017 Completers showed 83% and 56.5% (IPM), 53.3% and 64.9% (insulin), and 74.1% and 64.1% (immunizations) of students perceived bonus activities were helpful or very helpful in preparation for lab.

**CONCLUSION:** Bonus assignments provide opportunities to practice skills, gain confidence in subject areas, and allow students to be more prepared for participation in laboratory activities. While these activities did not appear to improve assessment scores, this illustrates their appropriateness as bonus activities, rather than required preparation.

**148. Correlation of internal and external characteristics with depressive symptoms in pharmacy residents over the residency year** *Evan Williams, Pharm.D., MBA*, Marissa Ross, Pharm.D. Candidate 2019, Samahn Soleimanian, Pharm.D. Candidate 2019 and Vasudha Gupta, Pharm.D.; College of Pharmacy, Roseman University of Health Sciences, Henderson, NV

**INTRODUCTION:** Recently published data indicate pharmacy residents experience high levels of depressive symptoms. These symptoms have not been correlated with any specific factors. This data presents specific correlates of depressive symptoms and highlights changes over the residency year.

**RESEARCH QUESTION OR HYPOTHESIS:** What factors correlate with depressive symptoms in pharmacy residents and do they change over the residency year?

**STUDY DESIGN:** A time-series study was conducted.

**METHODS:** A nationwide online survey of pharmacy residents gathered demographic data and assessed rates of depressive symptoms using the 9-Question Patient Health Questionnaire (PHQ-9) at 4 time points throughout the 2017–2018 residency year. Factors within the residency and external factors were correlated with PHQ-9 scores greater than 10, indicating high likelihood of depression, using logistic regression controlling for concomitant diagnosis and treatment of depression.

**RESULTS:** Surveys sent to 2,131 programs nationally yielded 633 responses on average at each time point. In July, the only significant correlates of depressive symptoms were working outside of residency ($p=0.031$) and director support ($p=0.004$). By November, exercise, being in a relationship, adequate sleep, and higher income levels were protective from depressive symptoms ($p<0.01$), while director/preceptor support, hours worked, effective teaching methods, program organization, and stress level related to the residency were strongly correlated with depressive symptoms ($p<0.001$). These factors persisted through March, and added the likelihood of having made a major medical error ($p<0.001$), while income level was no longer protective. In June, director support and having made a major medical error were the only residency related factors associated with depressive symptoms.

**CONCLUSION:** Exercise, sleep, and close personal relationships were protective of depressive symptoms throughout the residency, while residency-specific factors including hours worked, effective teaching methods, program organization, and stress level were associated with depressive symptoms in November and March, but largely resolved in June. Director support was the only significant internal correlate throughout the residency year.

**149. Student perceptions of simulated electronic medical record use and value within an introductory experiential pharmacy course** Olga Hilas, Pharm.D., MPH, *Tina Caliendo, Pharm.D.*; Clinical Health Professions, St. John's University, Queens, NY

**INTRODUCTION:** All first professional year (P1) students of the Doctor of Pharmacy program at St. John's University are required to successfully complete an introductory experiential pharmacy course. Simulation activities are utilized within this course to introduce students to various areas of pharmacy practice and "real-world" patient care experiences. A number of course activities recently incorporated the use of a simulated electronic medical record (EMR) to determine the value of such a program on student learning.

**RESEARCH QUESTION OR HYPOTHESIS:** Is a simulated EMR a valuable learning tool for P1 pharmacy students?

**STUDY DESIGN:** Qualitative / descriptive study

**METHODS:** A 30-question survey was developed and emailed to all P1 pharmacy students enrolled in a simulated introductory experiential pharmacy course. Completion of the survey was voluntary and the information collected was done so anonymously.

**RESULTS:** A total of 153 of 230 students (67%) completed the survey. Overall, >90% of student respondents *strongly agreed or agreed* that the simulated EMR: (1) is an important, realistic and valuable learning tool to introduce to P1 students in preparation for their subsequent experiential courses; (2) is effective for learning about a pharmacist's role in transitions of care activities; and (3) should continue to be used in the current course and be incorporated into other courses in the future. In addition, >80% of student respondents *strongly agreed or agreed* that the simulated EMR helped to develop skills needed to provide patient care as defined by the Pharmacists' Patient Care Process and also increased confidence in their professional abilities.

**CONCLUSION:** Incorporation of a simulated EMR into an introductory experiential pharmacy course allows for the effective application of pharmacy principles and practice of "real-world" patient care activities among P1 pharmacy students.

**150. Effect of a problem-based learning activity on HIV exam scores** *Ayse Elif Ozdener, Pharm D, BCACP, CDE, AAHIVP*, Malgorzata Slugocki, Pharm D; Fairleigh Dickinson University School of Pharmacy and Health Sciences, Florham Park, NJ

**INTRODUCTION:** ACPE standards recommend the integration of active learning in the pharmacy curricula. Active learning exercises

such as problem-based learning (PBL) activities enhances the student's critical thinking and problem-solving skills. These skills are vital for pharmacist working in direct patient care.

**RESEARCH QUESTION OR HYPOTHESIS:** To determine the effect of a PBL activity on HIV exam scores

**STUDY DESIGN:** Retrospective cohort analysis

**METHODS:** Second professional year (P2) students in 2016 were the control group and learned the topic of HIV through traditional lecture methods. The study group was P2 students in 2017 and learned about HIV through lecture and a PBL activity. Both groups were taught by the same faculty. Student knowledge was assessed through multiple choice exam questions. Questions remained the same for the 2016 and 2017 P2 cohorts. Study and control groups' exam results were compared to determine if the PBL activity made a significant impact in the number of correct answers. Chi-square test for proportions and Fisher's exact test were used. Statistical significance was defined as $p \leq 0.05$.

**RESULTS:** There were twenty-five questions that was included in the analysis. There were 80 and 76 exam takers in the 2016 and 2017 P2 cohorts, respectively. A statistically significant difference in the number of correct answers between the two cohorts was only found in 5 of the 25 questions (question 2: p=0.012; question 7: p=0.0001; question 9: p=0.0025; question 23: p=0.0082; question 25: p=0.0087).

**CONCLUSION:** This PBL activity had a modest impact on student exam performance. A limitation to our study is that the PBL activity was not graded, therefore, it could have affected student engagement and retention of the content in the PBL activity. In the future, this PBL activity will be graded in order to increase student participation.

**151. Use of objective statements in pharmacotherapy journals (1)**

*Richard Ogletree Jr., Pharm.D.*[1], Chad Burch, BSPS[2], Paige Davis, BSPS[2]; [1]Self-Employed, Madison, MS [2]School of Pharmacy, University of Mississippi, Jackson, MS

**INTRODUCTION:** The International Committee of Medical Journal Editors (ICMJE) guidance on the submission of original research recommend the use of a structured abstract, and directs the author to "State the specific purpose or research objective of, or hypothesis tested by, the study or observation." By definition, an objective statement should be goal oriented. However, in research publications, the listed objective often describes the process of research rather than its aim.

**RESEARCH QUESTION OR HYPOTHESIS:** What proportion of the objective statements included in abstracts of major pharmacotherapy journals are goal-oriented?

**STUDY DESIGN:** This was a retrospective, observational study using previously published articles.

**METHODS:** The journals, *Pharmacotherapy* and *Annals of Pharmacotherapy* were selected to be used in this project as each request structured abstracts for original research submissions. Author instructions were reviewed to see the exceptions to this expectation, and affected articles were not included. Targeted articles were published between January 1, 2017 and June 15, 2018. The abstract of each study was reviewed for the objective(s) given. Two reviewers characterized the terminology used as goal-oriented or process-oriented. When assessing an article, a numerical value was assigned to the verb(s) used. A goal-oriented verb was valued 1, while a process-oriented verb was assigned -1. Verbs deemed indeterminate were valued at zero. When more than one objective verb was used the scores were added. A score of greater than zero was necessary to classify an article's verb use as goal-oriented. Utilizing VassarStats, results were to be reported as proportion, with a Wilson Interval.

**RESULTS:** Of the 222 articles assessed, 81 had a goal-directed objective statement (0.3649; Wilson Interval: 0.3022-0.4323).

**CONCLUSION:** In this sample, goal-oriented objective statements were used less than half the time. We would like to challenge authors, editors, and reviewers to pay closer attention to this important aspect of a research paper.

**152. Evaluation of community pharmacists' background training, perception and attitude towards physical assessment skills**

*Sowndramalingam Sankaralingam, MBBS, Ph.D.*[1], Hanna Mohamed, BSc Pharm[1], Yaw Owusu, Pharm.D., MSc[1], Ahmed Awaisu, B.Pharm, Ph.D.[1], Nadir Kheir, Ph.D[2]; [1]College of Pharmacy, Qatar University, Doha, Qatar [2]Faculty of Medical and Health Sciences, University of Auckland, Auckland, New Zealand

**INTRODUCTION:** Pharmacists are increasingly involved in direct patient care. Therefore, physical assessment skills have become essential to evaluate patients and to monitor response to therapy. Teaching of these skills have been incorporated into the curricula of several US pharmacy schools. Community pharmacists practicing in Qatar come from different geographic regions with varying educational backgrounds.

**RESEARCH QUESTION OR HYPOTHESIS:** It is unknown whether these community pharmacists have received training on physical assessment skills during their pharmacy education. Furthermore, their self-perceived skills and attitude toward performing these skills and their willingness to learn them through continuing professional development (CPD) program is unknown.

**STUDY DESIGN:** A cross-sectional web- and paper-based survey was conducted among a randomly selected sample of community pharmacists in Qatar.

**METHODS:** Questions assessing pharmacists' background training, perception, attitude and willingness to learn 28 different physical examination skills were used. Face and content validity, and piloting were conducted by experts in teaching physical assessment skills and questionnaire development process. Data were analyzed using SPSS version 23. Both descriptive and inferential statistical analyses were applied.

**RESULTS:** More than 70% of the respondents had received training on assessment of vital signs and perceived themselves as competent. About 30% of the pharmacists indicated performing musculoskeletal assessments in their current practices. Majority of respondents were "very willing" to learn most physical assessment skills through CPD. Examination of the ear, nose and throat and assessment for drug

allergy were the top skills they were willing to learn. Furthermore, there was a significant association between having formal training on physical assessment skills and pharmacists' perceived competency in performing and utilizing the skills in practice (P<0.01).

**CONCLUSION:** Community pharmacists practicing in Qatar had reported some training on physical assessment skills and showed willingness to learn additional skills. This will guide in developing professional development sessions to train practicing pharmacists.

## EMERGENCY MEDICINE

**153. Capacity for conducting multicenter emergency pharmacy research in the United States** Asad E. Patanwala, Pharm.D., MPH[1], *Kyle Weant, Pharm.D., BCPS, FCCP*[2], Nicole Acquisto, Pharm.D.[3]; [1]Pharmacy Practice and Science, The University of Arizona College of Pharmacy, Tucson, AZ [2]Department of Pharmacy, Medical University of South Carolina, Charleston, SC [3]Department of Pharmacy, University of Rochester Medical Center, Rochester, NY

**INTRODUCTION:** There are many single center research projects published in the field of emergency medicine (EM) pharmacy practice. However, multicenter research projects are relatively rare. The capacity of EM pharmacists to participate in such projects has not been previously investigated.

**RESEARCH QUESTION OR HYPOTHESIS:** To determine the capacity of a national EM pharmacy network to conduct multicenter research.

**STUDY DESIGN:** This was a cross-sectional national survey conducted in the United States.

**METHODS:** The survey was developed using an iterative process to establish face and content validity. Questions were developed and revised until the survey was considered to be appropriate by the investigators. Ten EM pharmacists from geographically diverse locations in the United States pilot tested the survey for further refinement. Members of the ACCP EM practice and research network who were not students or residents were invited to complete the survey using Research Electronic Data Capture. Online consent was obtained prior to survey completion. The survey consisted of 14 questions, which was expected to take less than 5 minutes to complete. Data were descriptively evaluated.

**RESULTS:** There were a total of 637 potentially eligible participants for the survey. Of these, 98 completed the survey (15% response rate). Sixty-three (64%) participants had a Postgraduate Year-2 residency in EM pharmacy, 66 (67%) had at least one prior peer-reviewed publication, and 15 (15%) had received prior research grant funding. Overall, 87% (n=85) were willing to participate in multicenter research without funding and 66 (67%) were willing to participate without receiving authorship. In terms of study functions, 91 (93%) could participate in retrospective acquisition of data and 48 (49%) could participate in observational studies involving a patient consent procedure.

**CONCLUSION:** A substantial number of EM pharmacists are willing to participate in multicenter research. The number of participants decreases without provision of authorship or for studies involving patient consent.

**154. Aspirin platelet reactivity testing to guide therapy for patients with traumatic intracranial hemorrhage** *Darla Eastman, Pharm.D., BCPS*[1], Nicole Draker, Pharm.D. Candidate[1], Carlos Pelaez, MD, FACS[2], Sarah Spilman, MA[2], Kelly Tang, DO Candidate[3], Richard Sidwell, MD, FACS[2]; [1]Drake University College of Pharmacy and Health Sciences, Des Moines, IA [2]Trauma Services, Trauma Services, UnityPoint Health, Des Moines, IA [3]Des Moines University, Des Moines, IA

**INTRODUCTION:** Treatment of patients presenting with traumatic intracranial hemorrhage (tICH) may be complicated when patients are taking antiplatelet medications including aspirin and may require emergent reversal with platelets. In order to make transfusion decisions, the care team needs to determine if the patient was taking an antiplatelet medication prior to admission and if the patient is therapeutic on that medication.

**RESEARCH QUESTION OR HYPOTHESIS:** We hypothesized that aspirin platelet reactivity test (PRT) results could be used to quickly ascertain which patients were taking aspirin prior to admission, and results could safely guide aspirin reversal for patients who were therapeutic on the medication.

**STUDY DESIGN:** A retrospective chart-review study of patients who sustained blunt tICH and received a PRT for known or suspected aspirin use between June 2014 and December 2016 at a Level I trauma center.

**METHODS:** Differences were assessed with Kruskal-Wallis and chi-square tests.

**RESULTS:** 150 patients met study inclusion criteria, and 115 (77%) patients were determined to be taking aspirin prior to admission. PRT results were available approximately 1.7 hours (IQR: 0.9, 3.2) after arrival; 18 patients (16%) taking aspirin as a home medication were found to be non-therapeutic on aspirin and 16 (90%) of those patients were spared platelet transfusion. Seven percent (n=10) of all patients had a clinically significant progression of the head bleed, but this did not differ by inhibition or transfusion status. Full medication reconciliation by a pharmacist occurred an average of 8.6 hours (IRQ: 1.3, 27.1) after patient arrival, however one-third of patients' home medications were never reconciled.

**CONCLUSION:** If appropriately tested, results suggest that platelet reactivity testing can safely guide care decisions and supplement medication reconciliation efforts in the initial hours after trauma.

**155. Piperacillin-tazobactam versus tobramycin-based antibiotic prophylaxis therapy for type iii open fractures** *Suhair Shawar, Pharm. D., BCPS*; The Ohio State Wexner Medical Center, Coumbus, OH

**INTRODUCTION:** Type III long bone open fractures are associated with up to 50% infection rates without antibiotic coverage. The optimal antibiotic regimen for open fracture prophylaxis remains unclear and the literature is limited comparing the safety and efficacy of different antibiotic regimens.

**RESEARCH QUESTION OR HYPOTHESIS:** The use of piperacillin-tazobactam for type III open fracture is associated with less AEs compared to tobramycin-based antibiotic regimen.

**STUDY DESIGN:** Single center, retrospective, cohort study

**METHODS:** Patients were included if they were admitted for ≥ 24 hours from January 2010 to December 2016 and received either extended-interval tobramycin (≥ 7 mg/kg) plus cefazolin or clindamycin or single agent piperacillin-tazobactam for open fracture prophylaxis. The primary outcome was the rate of composite adverse events (AEs), which included nephrotoxicity, surgical site infection (SSI), and hospital readmission with surgical intervention due to infection within 60 days from injury. Secondary outcomes included the rate of SSI within 30 and 60 days from injury. Student *t* and the Mann-Whitney U tests were used for continuous variables and Chi-square or Fischer's exact tests were used for categorical variables. A two-tailed significance < 0.05 was considered statistically significant.

**RESULTS:** There were 85 patients included in this study. Of the 62 patients in the tobramycin group, 20 (32.3%) patients experienced at least one AE compared to 3 (13%) patients in the piperacillin-tazobactam group (p=0.10). The overall composite AE score was 32 events, 29 events in the tobramycin group compared to 3 events in the piperacillin-tazobactam group. At 60 days, SSI occurred in 20 patients (32.3%) in the tobramycin group vs. 1 (4.3%) in the piperacillin-tazobactam group (p=0.009).

**CONCLUSION**: There was no difference in the composite AEs in the piperacillin-tazobactam compared to tobramycin group. However, SSI within 30 and 60 days was significantly higher in the tobramycin group.

**156. Phenobarbital vs benzodiazepines for alcohol withdrawal treatment: evaluation of three institutional protocols in the emergency department** *Amelia Nelson, Pharm.D.*[1], Joy Kehoe, Pharm.D.[2], Kevin Kaucher, Pharm.D.[1]; [1]Department of Acute Care Pharmacy, Denver Health Medical Center, Denver, CO [2]Denver Health Medical Center, Denver, CO

**INTRODUCTION:** Recent drug shortages involving most IV benzodiazepines have left institutions scrambling to incorporate alternative agents into their treatment protocol for alcohol withdrawal. The objective of this study is to describe the effectiveness and safety of our institutional protocols during three time periods utilizing benzodiazepines and barbiturates for the acute treatment of alcohol withdrawal in the emergency department

**RESEARCH QUESTION OR HYPOTHESIS:** will incorporating phenobarbital into treatment protocol for alcohol withdrawal be effective & safe in the ED?

**STUDY DESIGN:** Single-center, retrospective, cohort

**METHODS:** Adult patients presenting to the ED requiring treatment for acute alcohol withdrawal from April 1st, 2016 to January 31st, 2018 were reviewed for study inclusion. Patients were included if they were 18 years or older and received at least one dose of treatment according to documented symptom severity score. Dependent on availability of IV benzodiazepines and barbiturates, 3 separate protocols were developed to account for product availability. Patients were treated according to the specific protocol that was implemented during those 3 separate time periods. These included IV diazepam alone, IV lorazepam & IV phenobarbital, or IV phenobarbital alone. The primary outcome was the rate of ICU admission. Secondary outcomes included rate of mechanical ventilation, rate of hospitalization, length of hospital stay, length of ICU stay, primary admission diagnosis, total dose of benzodiazepines, total dose of phenobarbital, SEWS scores, and rate of return within 30 days

**RESULTS:** 300 patient encounters were included. Overall baseline characteristics were equal across groups, except for age. There was no difference in rate of ICU admission from the ED between groups (D:8, L&P:11, P:13 patients, p=0.99). Rate of mechanical ventilation was no different across all groups (D:1, L&P:3, P:3 patients, p=0.55). Total benzodiazepine use was decreased in phenobarbital treated patients (D:154, L&P:97, P:29 mg, p=0.0001).

**CONCLUSION:** Incorporation of phenobarbital into alcohol withdrawal treatment protocol is both safe and effective.

**157. Patient satisfaction with pain management for post-discharge patients from the emergency department** *Amina Alkhalaf, Pharm.D. Candidate 2019*[1], Raneem Bukhari, Pharm.D. Candidate 2019[1], Elham Alshehri, Pharm.D. Candidate 2019[1], Arwa Alkhalaf, Ph.D[2], Hussain Bakhsh, Pharm.D.[1]; [1]Department of Clinical Pharmacy, College of Pharmacy, King Abdulaziz University, Jeddah, Saudi Arabia [2]Institute of Educational Graduate Studies, King Abdul Aziz University, Jeddah, Saudi Arabia

**INTRODUCTION:** Under-treatment of pain in Saudi Arabia has been reported in the emergency department (ED). Pain management in this area with opioids is minimal and limited to specific populations. Previous studies in the field of pain management were based on pain-related measurements overlooking patient satisfaction upon discharge. In Saudi Arabia, patient's satisfaction in the ED has not been studied. This study aims to assess patient satisfaction with pain management they received in the ED after discharge.

**RESEARCH QUESTION OR HYPOTHESIS:** Based on a previous study, we hypothesize that patients were being undertreated in the ED in Saudi Arabia.

**STUDY DESIGN:** This study followed a prospective, cross-sectional design.

**METHODS:** The study was conducted during two months, in a tertiary academic hospital in Saudi Arabia. A modified questionnaire was conducted through phone calls, using the primary outcome question "How often was your pain well controlled in the ED" for adult patients that were complaining of pain, received analgesics in the ED within one week. We used multivariate analysis through a correlational design to identify predictors of patient's satisfaction.

**RESULTS:** This study included 76 patients. The mean age was 40.88±15.47 years, 65 (85.5%) received a non-opioid, while 11 (14.5%) received an opioid. 50 (65.8%) thought they had enough analgesics. The mean initial pain score was 8.11±1.93. At discharge was 4.38±3.03. Multivariate regression results show, ED diagnosis (coefficient =-0.23;p =0.02) chronic analgesic use (coefficient =1.25;p =0.02), type of analgesic received (coefficient =-1.11;p =0.16), initial pain score (coefficient =0.39;p =0.02), pain score at discharge (coefficient =-0.51;p =0.00), perception of enough analgesic given (coefficient =2.30;p =0.00), and staff helpfulness (coefficient =0.19;p

=0.035) was significantly associated with patient satisfaction except for the type of analgesic (model $R^2$=0.54)

**CONCLUSION:** Patient satisfaction predictors were documented despite minimal opioid use.

**158. Exploration of factors impacting propofol requirements during procedural sedation in the emergency department** *Maegan Wells, Pharm.D.*[1], Chara Calhoun, Pharm.D., BCPS[1], Jeffrey Caporossi, MD[2], Ryan Barnes, D.O.[2], Kyle Weant, Pharm.D., BCPS, FCCP[1]; [1]Department of Pharmacy, Medical University of South Carolina, Charleston, SC [2]Department of Emergency Medicine, Medical University of South Carolina, Charleston, SC

**INTRODUCTION:** Propofol is commonly utilized in the emergency department (ED) for procedural sedation. While the impact of age on dosing requirements has been investigated, other patient specific factors that may affect propofol dose requirements during procedural sedation are not well understood.

**RESEARCH QUESTION OR HYPOTHESIS:** The study objective was to determine the effect of patients' substance use history on the total propofol dose required during procedural sedation in the ED.

**STUDY DESIGN:** Retrospective, single-center cohort study

**METHODS:** This was a retrospective cohort study conducted at a Level 1 academic medical center ED. Patients ≥18 years of age who received propofol for procedural sedation between January 2015 and August 2017 were included. Patients were grouped based on a documented history of substance use at the time of presentation: alcohol use disorder, illicit drug use disorder, or no documented substance use disorder. The total and weight-based propofol dose requirements for procedural sedation, opioid requirements, and adverse events were compared between groups.

**RESULTS:** A total of 101 procedural sedations were included in the analysis. There was no significant difference in demographics, procedures, or procedural opioid requirements found amongst the groups. Patients with a history of substance use disorder, including alcohol or illicit drugs (n = 17), had a significantly higher total weight-based propofol requirement than patients without a substance use disorder ($p < 0.01$). In addition, patients with a substance use disorder required more repeat doses during the procedure than those without a use disorder ($p = 0.04$). No significant differences were found in the incidence of adverse effects or respiratory suppression amongst the groups.

**CONCLUSION:** Patients with a history of alcohol or illicit drug use disorder may require higher total weight-based doses of propofol for procedural sedation. Further investigations are necessary to better isolate specific medication-related factors that contribute to the need for higher doses.

**159. Efficacy of ketamine for initial control of acute agitation in the emergency department: a pilot study** *Justin Lin, Pharm.D.*[1], Yelena Figuerado, Pharm.D.[2], Adrienne Kercsak, Pharm.D., BCPS[2], Jonathan Lee, MD[3], Valerie Norton, MD[3], Harminder Sikand, Pharm.D., FCCP, FASHP[2]; [1]Department of Pharmacy, Scripps Mercy San Diego, San Diego, CA [2]Department of Pharmacy, Scripps Mercy Hospital, San Diego, CA [3]Scripps Mercy San Diego, San Diego, CA

**INTRODUCTION:** Clinicians often encounter agitated patients that pose a danger to staff. Current treatment options include benzodiazepines and antipsychotics. Ketamine is an agent that rapidly induces dissociation resulting in analgesia and amnesia, and maintains cardiovascular stability, spontaneous respirations, and airway reflexes. Ketamine has been utilized for agitation in previous studies, demonstrating quicker time to sedation compared to other agents. However, there are no prospective, randomized studies comparing ketamine to other agents in the initial management of acute agitation in the Emergency Department (ED).

**RESEARCH QUESTION OR HYPOTHESIS:** Determine the efficacy and safety of ketamine compared to parenteral haloperidol plus lorazepam for initial control of acute agitation.

**STUDY DESIGN:** Prospective single-institution, randomized, non-blinded real world, standard of care pilot study.

**METHODS:** Patients ≥ 18y/o with an active diagnosis of combative agitation were included, and randomized via a computerized random number generator to either treatment arm. Patients with known contraindications to study medications were excluded. Patients received ketamine (4 mg/kg IM, maximum 500 mg or 1 mg/kg IV) or haloperidol/lorazepam (haloperidol 5-10 mg IM or IV + lorazepam 1-2 mg IM or IV). The primary outcome was the sedation within 5 minutes, as defined by a Richmond Agitation and Sedation Scale (RASS) score of ≤0. Secondary outcomes included sedation within 15 minutes, time to sedation, and safety. Results were analyzed using Fisher's exact test and the Mann-Whitney test.

**RESULTS:** Significantly more patients who received ketamine compared to haloperidol/lorazepam were sedated within 5min (p=0.01) and 15min (p=0.001). The median time to sedation in patients who received ketamine compared to haloperidol/lorazepam was 10min and 37min respectively (p=0.001). Patients who received ketamine experienced a nonsignificant, transient tachycardia (p=0.13) and hypertension (p=0.15).

**CONCLUSION:** In patients with combative agitation, ketamine was significantly more effective ($p<0.05$) than haloperidol/lorazepam at the initial control of acute agitation, and was not associated with any significant adverse effects.

**160E. Opioid overdose education and naloxone distribution from the emergency department: healthcare professionals' perceptions pre-implementation** *Heather Blue, Pharm.D.*[1], Kelsey Melgaard, BS[2], Laura Carpenter, Pharm.D.[2], Lei Zhang, MS[3], Nicholas Van Deelen, MD[4]; [1]Department of Pharmacy Practice and Pharmaceutical Sciences, University of Minnesota College of Pharmacy, Duluth, MN [2]University of Minnesota College of Pharmacy, Duluth, MN [3]Clinical and Translational Sciences Institute, University of Minnesota, Minneapolis, MN [4]St. Luke's Hosptial, Duluth, MN

Presented at the Minnesota Society of Health-Systems Pharmacists Annual Meeting, St. Cloud, MN, April 19, 2018.

**161. Implementation and evaluation of a pharmacist-driven prospective discharge prescription review process in an academic medical center emergency department** Emily Griffin, Pharm.D., MS, BCPS[1], *Andrew North, Pharm.D., MBA, BCPS, BCCCP*[2], Elizabeth Rozycki, Pharm.D., BCPS[1], Trisha Jordan, Pharm.D., MS[1], Jennifer Rodis, Pharm.D., BCPS, FAPhA[3], Marjorie Neidecker, Ph.D., MEng, RN, CCRP[4]; [1]The Ohio State University Wexner Medical Center, Columbus, OH [2]Department of Pharmacy, Ohio State University Wexner Medical Center, Columbus, OH [3]College of Pharmacy, The Ohio State University, Columbus, OH [4]The Ohio Sate College of Pharmacy, Columbus, OH

**INTRODUCTION:** An internal retrospective review of targeted emergency department (ED) discharge prescriptions demonstrated a 13.6% potential intervention rate. With this high rate of missed opportunities, a need was identified for a process for targeted review of discharge prescriptions in the ED. The aim of this project was to develop a real-time notification system for targeted discharge prescription review as well as an associated ED pharmacist workflow and to evaluate the intervention rate achieved through targeted discharge prescription review.

**RESEARCH QUESTION OR HYPOTHESIS:** Does prospective targeted discharge prescription review by a pharmacist increase appropriate prescribing? Additionally, what intervention types are most common and what medication classes are highest risk?

**STUDY DESIGN:** Single-center prospective implementation of quality improvement pilot project from February 19th, 2018 to May 14th, 2018.

**METHODS:** Discharge prescriptions that met the inclusion criteria were filtered into a real-time work queue for ED pharmacists. ED Pharmacists reviewed the prescriptions and recommended or independently made any necessary adjustments according to institutional pharmacist privileges. Interventions were reviewed and categorized to assess rate of intervention and the types of medication-related problems identified.

**RESULTS:** During the data collection period, 378 discharge prescriptions were reviewed. A total of 158 prescriptions were identified as having at least one medication related problem (MRP). Of these, 70 prescriptions required intervention resulting in an 18.5% intervention rate by the pharmacist. The most common MRPs were a change in the dose/frequency or duration/refills of the medication. The highest number of interventions was made for anticoagulants and anti-infectives.

**CONCLUSION:** By using targeted discharge prescription review criteria, pharmacists were able to effectively impact appropriate prescribing in the ED.

**162. Implementation of a multidisciplinary outpatient pulmonary embolism protocol in the emergency department** *Laura Martin, Pharm.D.*, Andrew Tyrrell, Pharm.D.; Providence St. Peter Hospital, Olympia, WA

**INTRODUCTION:** Studies have shown that outpatient management of low-risk patients with pulmonary embolisms (PE) from the emergency department (ED) is safe. While studies and guidelines support this practice, provider uptake has been variable. Validated tools have proven reliable in identifying patients eligible for outpatient management. ED pharmacist can help evaluate patient eligibility for outpatient management, fill prescriptions and provide discharge education. Studies have shown that ED pharmacist providing discharge education can reduce readmission rates. **Hypothesis:** Implementation of a multidisciplinary outpatient PE protocol will increase the number of PE patients discharged from the ER across two emergency departments in Washington State.

**STUDY DESIGN:** Retrospective chart review was conducted to include a six month period of time pre and post-protocol analysis. Patients with a primary diagnosis of pulmonary embolism were reviewed to see if they met criteria for outpatient management and were discharged or admitted. Data was collected to help elucidate the narrative behind low-risk adult PE patients.

**METHODS:** A protocol was implemented involving ED pharmacists to streamline outpatient management of low risk PE patients from the ED. Patients were determined to be low risk by modified Hestia criteria and/or simplified PESI criteria along with physician discretion. Eligible patients were provided an initial dose and medication counseling. Outpatient prescriptions were filled as able and patient follow up was completed by an RN to ensure smooth transitions of care. The primary outcome compared the number of pulmonary embolism patients admitted and discharged pre and post protocol.

**RESULTS:** Pulmonary embolism patients that were discharged from the ED increased from 9% (8/94) to 20% (15/75) following protocol implementation.

**CONCLUSION:** Implementation of a multidisciplinary protocol led to an increase in outpatient management of low-risk patients with pulmonary embolisms from the ED.

**163. Comparison of three different prothrombin complex concentrate regimens for emergent warfarin reversal: PCCWAR study** Scott Dietrich, Pharm.D.[1], *A. Shaun Rowe, Pharm.D., BCPS, BCCCP, FNCS*[2], Patrick Blankenship, Pharm.D.[3], Craig Cocchio, Pharm.D., BCPS[4], Amanda Harmon, Pharm.D.[5], Steven Nerenberg, Pharm.D.[6]; [1]University of Colorado Health, North Region, Fort Collins, CO [2]Department of Clinical Pharmacy, University of Tennessee Health Science Center College of Pharmacy, Knoxville, TN [3]Blount Memorial Hospital, Maryville, TN [4]Ernest Mario School of Pharmacy at Rutgers, The State University of New Jersey, Piscataway, NJ [5]St. Joseph's Hospital, Safety Harbor, FL [6]Department of Pharmacy Practice and Administration, Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ

**INTRODUCTION:** Prothrombin complex concentrate (PCC) is the agent of choice for emergent warfarin reversal. Controversy remains surrounding the optimal PCC dose and the specific PCC product. Fixed-dose 4PCC and activated PCC (aPCC) regimens have been shown to have similar INR reversal outcomes as standard-dose 4PCC for emergent warfarin reversal, but have not been directly compared.

**RESEARCH QUESTION OR HYPOTHESIS:** To evaluate the effectiveness of three different PCC dosing regimens on the reversal of warfarin: standard-dose 4PCC, fixed-dose 4PCC, and fixed-dose aPCC.

**STUDY DESIGN:** IRB approved multicenter, retrospective cohort analysis

**METHODS:** Patients admitted between January 1, 2017 and December 31, 2017 were considered for inclusion if they received a warfarin reversal regimen of interest. Patients without a follow up INR within 24 hours of treatment, had a pretreatment INR of less than 2, required massive transfusion, received plasma prior to PCC, or were treated for an acute warfarin ingestion were excluded.

**RESULTS:** A total of 140 patients were included for analysis (standard-dose 4PCC n=77, fixed-dose 4PCC n=31, fixed-dose aPCC n=32). A higher proportion of those who received standard-dose 4PCC were able to achieve an INR of less than 1.4 (59 [76.6%] vs. 16 [51.6%] vs. 18 [56.3%]; p=0.0172). However, there was no difference in groups with regards to absolute (2.1 ± 1.7 vs. 2.5 ± 2.5 vs. 2.7 ± 3.8; p=0.5146) or percent change in INR (55.7% ± 16.2% vs. 56.1% ± 16.9% vs. 52.8% ± 16.3%; p=0.6546). Three thrombotic events were documented within 14 days of PCC treatment. However, there was no difference in the proportion of events in each group (1 [1.3%] vs. 1 [3.2%] vs. 1 [3.1%]; p=0.5881).

**CONCLUSION:** A higher proportion of patients who received standard-dose 4PCC achieved an INR of less than 1.4; however, type of treatment did not affect the absolute or percent change in INR.

## ENDOCRINOLOGY

**164E. Evaluation of glycemic control with endotool Glucose Management System for insulin infusion therapy** *Lauren Igneri, Pharm.D., BCPS, BCCCP*[1], Alan Schorr, DO, FAAIM, FACE[2], Patricia Gilbert, MSN, RN[2], Katherine Krol, BSN, CCRN[2], Brandon Kim, Pharm.D., MBA[2], Jessica Ellis, Pharm.D.[2], Suzette Cunicelli, RPh[2], Benjamin Solomon, MD[2]; [1]Pharmacy Department, Cooper University Health Care, Camden, NJ [2]St. Mary Medical Center, Langhorne, PA

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**165. Association between diabetes-related distress and diabetes-specific quality of life in Muslims with type 2 diabetes** *Zheng Kang Lum, BSc (Pharm) (Hons)*[1], Joyce Lee, Pharm.D., BCPS, BCACP[2]; [1]National University of Singapore, Singapore, Singapore [2]Department of Pharmacy, Faculty of Science, National University of Singapore, Singapore, Singapore

**INTRODUCTION:** Glycemic dysregulation in patients with Type 2 diabetes (T2DM) has been associated with high burden of psychosocial distress and impaired quality of life. Fasting, a religious activity carried out during Ramadan, has shown to cause dysregulation of glucose metabolism. The objective of this study was to examine the association between diabetes-related distress and quality of life in Muslims with T2DM who fast during Ramadan.

**RESEARCH QUESTION OR HYPOTHESIS:** Diabetes-related distress in patients who fast during Ramadan decreases diabetes-specific quality of life and impacts specific domains of life.

**STUDY DESIGN:** This was a multi-center, cross-sectional study conducted in Singapore.

**METHODS:** Muslims with T2DM, baseline HbA1c of ≤9.5% and eGFR of ≥30 mL/min were included while those with recurrent hypoglycemia or received active short-term corticosteroid therapy were excluded. Diabetes-related distress and diabetes-specific quality of life were measured by the Problem Areas in Diabetes (PAID) and the Audit of Diabetes-Dependent Quality of Life (ADDQoL), respectively. The questionnaires were administered within one month prior to Ramadan. The association between PAID and ADDQoL with its specific domains were established using the Pearson's product moment coefficient test.

**RESULTS:** A total of 62 individuals were analyzed and the mean age was 58.4±11.3 years with majority being females (67.7%). The mean PAID score was 23.7±19.9 with 15 (24.2%) individuals being highly distressed (i.e. PAID score ≥40). The mean average weight impact (AWI) of ADDQoL was 3.6±2.3. PAID was found to have moderate association with ADDQoL (r=-0.466, *p*=0.010), and it was significantly associated with most of the quality of life domains except "friends", "sex", "eating", and "drinking".

**CONCLUSION:** Diabetes-related distress was associated with poor diabetes-specific quality of life in Muslims who fast during Ramadan. Healthcare professionals should provide closer follow up and care support in anticipation of Ramadan.

**166. Impact of professional continuous glucose monitoring by clinical pharmacists in an ambulatory care setting** *Christie Schumacher, Pharm.D., BCPS, BCACP, BC-ADM, CDE*, Elizabeth Van Dril, Pharm.D., BCPS; Department of Pharmacy Practice, Midwestern University Chicago College of Pharmacy, Downers Grove, IL

**INTRODUCTION:** The use of continuous glucose monitors (CGMs) in the management of diabetes mellitus (DM) continues grow. Despite professional-use CGMs serving as an opportunity for clinical pharmacists to improve care and receive reimbursement for managing patients with DM, there is limited literature describing their involvement with this technology.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the value of clinical pharmacist-managed professional continuous glucose monitoring (pCGM) in the ambulatory care setting?

**STUDY DESIGN:** Retrospective, pre-post intervention chart review.

**METHODS:** Patients that had a professional CGM placed and more than 24 hours of data interpreted by a clinical pharmacist were included for analysis. The primary objective was to determine if pCGM improves measures of glycemic control, including percentage of time in target glycemic range, change in estimated average interstitial glucose and change in hemoglobin A1c (HbA1c) from baseline to post-intervention. Secondary objectives were to evaluate revenue generation, as measured by reimbursement rates for Current Procedural Terminology (CPT) codes 95250 and 95251, and

utilization of clinical pharmacist services related to pCGM use. All clinical data was extracted from subjects' electronic medical records, while reimbursement data was provided by the center's billing department.

**RESULTS:** Twenty-nine subjects that received pCGM were included for analysis. Subjects' mean baseline and post-intervention HbA1c was 9.0% and 8.3%, respectively (p=0.156). There was no difference in subjects' mean percentage of time in target glycemic range (p=0.966) or mean estimated average interstitial glucose (p=0.779) from baseline to post-intervention. Subjects met with the clinical pharmacist for a total of 68 visits during the 3-month period, 14 of which were unanticipated visits. The mean payment amount for CPT Code 95250 was $126.87, while $39.17 was received for 95251.

**CONCLUSION:** Clinical pharmacist-led pCGM demonstrated no improvement in measures of glycemic control; however, provided opportunities for optimization of antihyperglycemic therapy and resulted in reimbursement for clinical pharmacy services.

**167. Evaluation of blood glucose management in non-critical care, non-diabetic patients experiencing steroid-induced hyperglycemia** Broderick Olson, Pharm.D., MBA, Megan Bond, Pharm.D., BCPS, Laura Mudd, Pharm.D., BCCCP, *Joshua Gaborcik, Pharm.D., BCPS*; Department of Pharmacy, The Ohio State University Wexner Medical Center, Columbus, OH

**INTRODUCTION:** Certain medications can exacerbate hyperglycemia, even in patients without diabetes. One class of medications known to cause hyperglycemia is glucocorticoids. The onset of glucocorticoid induced hyperglycemia can be seen after two consecutive days of receiving an equivalent total daily dose of ≥ 40mg prednisone. The pharmacokinetic profile of insulin NPH makes it the drug of choice for treating steroid induced hyperglycemia in many cases.

**RESEARCH QUESTION OR HYPOTHESIS:** How is steroid-induced hyperglycemia being managed for non-diabetic patients in an inpatient teaching-focused general medicine service?

**STUDY DESIGN:** Retrospective chart review

**METHODS:** A retrospective, single-center medication use evaluation (MUE) was conducted at a large academic medical center. Patients without pre-existing diabetes who received an equivalent total daily dose of ≥ 40mg prednisone, experienced a minimum of one blood glucose reading ≥ 180mg/dL within 72 hours of receiving the initial steroid, and admitted to a general medicine service from January 1, 2017 to June 30, 2017 were included in the evaluation.

**RESULTS:** Fifty patients were included in this MUE. Steroids were prescribed for the following conditions: respiratory (56%), autoimmune (24%), inflammatory (8%), neurologic (8%), and hepatic (4%). Over a 72 hour period, the most common steroids used were intravenous methylprednisolone and oral prednisone. The median high blood glucose remained above 170 mg/dL throughout the 72 hours, and the median low remained at or above 120 mg/dL. The majority of patients (52%) did not receive insulin for hyperglycemia. When insulin was ordered, insulin aspart was used most often. Point-of-care-testing (POCT) was ordered in 70% of patients.

**CONCLUSION:** Use of high-dose steroids can lead to hyperglycemia in patients without pre-existing diabetes. From this MUE, pharmacist-directed quality improvement opportunities exist in order to improve the care of patients experiencing steroid-induced hyperglycemia including timely recognition of steroid induced hyperglycemia, recommendation to obtain routine POCT, and providing continuous insulin education to providers.

**168. Metformin prescribing patterns in previously ineligible adults using eGFR** *Rebecca A. Falter, Pharm.D.*, Roshani Patel, Pharm.D. Candidate 2019; Bernard J. Dunn School of Pharmacy, Shenandoah University, Winchester, VA

**INTRODUCTION:** Though metformin is the gold standard therapy for type 2 diabetes mellitus (T2DM) national prescribing rates are low, ranging from 40-60%. Metformin labeling was updated in 2016 to establish appropriateness of therapy using estimated glomerular filtration rate (eGFR) instead of serum creatinine (SCr). Past studies have noted using SCr restricted metformin's use, but data lacks to see if prescribing patterns and metformin utilization have changed since the labeling update.

**RESEARCH QUESTION OR HYPOTHESIS:** To examine the impact of metformin's recent label update on the prescribing patterns of metformin at an outpatient internal medicine practice.

**STUDY DESIGN:** A single-center, retrospective cohort study.

**METHODS:** Patients were included for chart review if at least 18 years old, diagnosed with T2DM, had a history of metformin use and were discontinued due to SCr restrictions between 2010 and 2016. Patients with severe renal dysfunction, documented metformin intolerance, or other contraindications were excluded.

**RESULTS:** A total of 186 patient charts were reviewed. The average age was 72, and most were male (65%) and Caucasian (96%). Only 27 (14.5%) met inclusion criteria, with 10 of the 27 (37%) restarting metformin after the labeling update. Of the 159 excluded, 71 (45%) had acceptable SCr and 40 (25%) were continued on metformin despite exceeding SCr restrictions. Of note, 67 of the 186 reviewed (36%) were eligible to continue metformin based on eGFR rather than SCr.

**CONCLUSION:** Utilizing eGFR increased the total number of patients eligible for metformin in this older population. Though metformin was reinitiated in 37% of the included patients, there is an opportunity for pharmacist intervention to further improve metformin utilization. Data was coming forward prior to the 2016 suggesting appropriateness of eGFR monitoring over SCr, which may explain why a notable number of patients were continued on metformin. Increased patient diversity would improve external validity of these results moving forward.

**170. What after metformin? Factors affecting prescribing patterns for patients with type II diabetes** Abdulrhman Althaqafi, Pharm.D. intern, Ahmed Alghamdi, BPharm, Maryam Alghamdi, Pharm.D., Marwan Allihaibi, BPharm, Eman Alzhrani, Pharm.D., Afnan Almahmoudi, Pharm.D. intern, *Majid Ali, BPharm, MSc (clinical pharmacy), PgCert,*

*PgDip*; College of Pharmacy, Umm Al-Qura University, Makkah, Saudi Arabia

**INTRODUCTION:** After lifestyle management, metformin is preferred initial monotherapy for treating Type II diabetes because of its proven efficacy and favorable side-effect profile. If initial treatment with metformin does not achieve target HbA1c or metformin is not tolerated, second-line therapy may be considered–guidelines offer open choice which may depend on several factors.

**RESEARCH QUESTION OR HYPOTHESIS:** What are the factors considered by physicians while prescribing second-line therapy after metformin?

**STUDY DESIGN:** Quantitative (cross-sectional survey).

**METHODS:** We conducted the survey with a sample of prescribers in Makkah and Jeddah cities. Questionnaire was designed and piloted including questions focusing on selection of second-line therapy [with reason(s)] in addition to or as an alternative to metformin. Physicians were invited on convenience sampling basis to participate.

**RESULTS:** Of 150 physicians contacted, 111 completed the questionnaire. Approximately all (96%) often prescribe metformin as first line mainly because it is 'inexpensive' and 'in compliance with guidelines'. Majority selected DPP-4 inhibitors (59%) and sulfonylureas (58%) after stopping metformin due to side effect while only 5% favored SGLT2-inhibitors. When metformin fails to reach target HbA1C, 73% physicians prefer adding sulfonylureas and 65% prefer DPP-4 inhibitors with only 7% preferring SGLT2-inhibitors–factors considered while selecting the therapy are last-measured HbA1C, renal function, comorbidities and patient weight. Majority said that their choice is not affected by hospital formulary (64%) or advertisement by pharmaceutical companies (95%). On statistical analysis using SPSS v23, significant difference (p=0.015 & p=0.009) was found in prescribing of SGLT2-inhibitors (alternative to metformin & addition to metformin) between government and private sector practitioners with private sector practitioners favoring SGLT2-inhibitors.

**CONCLUSION:** Sulfonylureas and DPP-4 inhibitors are considered as common choice after metformin in our setting. However, number of patients suffering from hypoglycemic episodes due to sulfonylureas remain open to be explored. SGLT2-inhibitors are less favored by some physicians despite increasing evidence available in their favor.

**171. External validation and comparison of two 30- day readmission prediction models in patients with diabetes** *Ahmad Alamer, Pharm.D.*, Asad E. Patanwala, Pharm.D.., BCPS, FCCP, FASHP, Ali Aldayyen, Pharm.D., Maryam Fazel, Pharm.D.., BCPS, BCACP, CDE; University of Arizona, College of Pharmacy, Department of Pharmacy Practice and Science, Tucson, AZ

**INTRODUCTION:** The HOSPITAL score and Diabetes Early Readmission Risk Indicator (DERRI) were designed to predict 30-day readmissions in medical and diabetes patients, respectively. Both models were developed and validated in different U.S. hospitals and were not externally validated at our institution.

**RESEARCH QUESTION OR HYPOTHESIS:** Are the HOSPITAL score and/or DERRI prediction models effective to predict 30-day readmission risk in diabetes patients at our institution?

**STUDY DESIGN:** This is a retrospective cohort study.

**METHODS:** Charts of adult diabetes patients who were admitted to Banner – University Medical Center Tucson/South (B – UMCT/S) from January 1$^{st}$, 2014 to September 31$^{st}$, 2017 were reviewed. One-hundred patients with a 30-day hospital readmission were randomly selected and compared to one-hundred control patients without 30-day readmission. The C-statistic test was used to assess discrimination of the two models and Hosmer-Lemeshow test was used to assess calibration.

**RESULTS:** Two hundred and twenty patients were screened. Two-hundred patients were included. The HOSPITAL score had a C-statistic of 0.731 (95% CI, 0.661-0.800) with good calibration ($p$= 0.211), while the DERRI model had a C-statistic of 0.796 (95% CI, 0.734-0.857) with good calibration ($p$= 0.114). There was no statistically significant difference between the two models in terms of discrimination ($p$= 0.055). In DERRI model, predictor components that showed most association with 30-day readmission were employment status, discharge within 90 days before admission, admission hematocrit, diagnosis of anemia and pre-admission insulin use. In HOSPITAL score, the most important predictors were number of admissions in the past year, length of hospital stay, hemoglobin at discharge, and sodium at discharge.

**CONCLUSION:** In an external population, both the HOSPITAL score and DERRI showed good performance in predicting 30-day readmission in diabetes patients with moderately high discrimination power and good calibration. There was a trend toward significance favoring the DERRI prediction model.

**172. Medication related problems in diabetic patients during Ramadan** *Majid Ali, BPharm, MSc (clinical pharmacy), PgCert, PgDip*, Amjad Albishi, Pharm.D. intern, Amjad Madkhali, Pharm.D. intern, Layal Baunes, Pharm.D. intern, Razan Alhazmi, Pharm.D. intern, Elaf Doman, Pharm.D. intern, Anwar Alhazmi, Pharm.D. intern, Abdulrhman Althaqafi, Pharm.D. intern, Hamid Alawi, Pharm.D. intern, Mohammad Alotaibi, Pharm.D. intern, Waleed Almalki, Pharm.D. intern, Waleed Alluqmani, Pharm.D. intern, Fahad Althobiani, Pharm.D. intern; College of Pharmacy, Umm Al-Qura University, Makkah, Saudi Arabia

**INTRODUCTION:** Ramadan is month in Islamic calendar in which healthy Muslim adults are obliged to fast from dawn till dusk everyday. This can have detrimental effect on health of some patients. Patients considered unfit for fasting by their doctor, are exempt from fasting. However, many diabetic patients insist on fasting during Ramadan making changes in their medication schedule with or without advice of healthcare-providers – medication-related issues in these patients are yet to be explored and addressed.

**RESEARCH QUESTION OR HYPOTHESIS:** What medication-related issues diabetic patients face while fasting during Ramadan?

**STUDY DESIGN:** Mixed method (qualitative followed by quantitative).

**METHODS:** Conducted in two phases: Phase I involved semi-structured face-to-face in-depth interviews with patients attending Diabetes Center in Makkah city. Interview guide consisting of questions exploring medication-related issues during Ramadan was prepared and piloted. All interviews were audio-recorded with patient consent, transcribed verbatim and thematically analysed later. Results of this phase were utilized to prepare structured questionnaire with same objectives but to capture the data from wider population. The questionnaire was piloted and appropriate changes were made. Patients were selected on convenience sampling basis in both phases.

**RESULTS:** Twenty interviews were conducted in Phase I, each ranging from 10-15 minutes. Main themes identified from the codes were; medication changes in Ramadan, diabetes self-management and lifestyle issues, future considerations for fasting and healthcare provider-related issues. Ninety-five patients completed the questionnaire in Phase II. Half of participants changed the way they take their medication-50% of these did so without healthcare-provider advice and 25% of these suffered from health-related problems. Most (80%) agreed that changing eating habits in Ramadan affect their diabetes control.

**CONCLUSION:** Health-related problems were found among diabetic patients who observed fasting in Ramadan especially in those who fasted or made changes in their medication schedule without healthcare provider advice. Changes in dietary habits could also be a contributing factor.

**173E. Impact of a collaborative pharmaceutical care service among patients with diabetes in Qatar Petroleum Healthcare Center: a multiple time series study** *Ahmed Awaisu, B.Pharm, Ph.D.*[1], Rana Ahmed Saleh, Pharm.D.[1], Sara Hamdi Abdulrhim, BSc (Pharm)[1], Nadir Kheir, Ph.D[2], Mohamed Abdelazim Hussain, BPharm[3], Ahmed Hussein Babiker, MSc[4]; [1]College of Pharmacy, Qatar University, Doha, Qatar [2]Faculty of Medical and Health Sciences, University of Auckland, Auckland, New Zealand [3]Qatar Petroleum Healthcare Center, Doha, Qatar [4]Pharmacy and Drug Control, Ministry of Public Health, Doha, Qatar

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**174. Association between quality of life and glycemic and lipid control in diabetic patients** Yazan Edrees, Pharm.D. intern[1], Jalal Abdulsalam, Pharm.D. intern[1], Rayan Allbaan, Pharm.D. intern[1], Eyad Bukhari, Pharm.D. intern[1], Yousuf Kutbi, Pharm.D. intern[1], *Majid Ali, BPharm, MSc (clinical pharmacy), PgCert, PgDip*[2]; [1]Umm Al-Qura University, Makkah, Saudi Arabia [2]College of Pharmacy, Umm Al-Qura University, Makkah, Saudi Arabia

**INTRODUCTION:** Alongside glycemic control, optimum lipid control is also important in diabetic patients to reduce the risk of cardiovascular mortality. Both can be associated with quality of life of the patient – little is known about the association.

**RESEARCH QUESTION OR HYPOTHESIS:** Is there any association between quality of life and glycemic and lipid control in diabetic patients?

**STUDY DESIGN:** Quantitative (cross-sectional study).

**METHODS:** Diabetic patients attending two diabetes centers in Makkah city were approached on convenience sampling basis. Validated questionnaire to assess diabetes related quality of life (DQOL) was administered. The questionnaire consists of 15 questions, scored out 75 and is negatively valenced – higher scores indicting low quality of life and vice versa. Recent HbA1c and cholesterol levels of patients who completed the questionnaire were retrieved from computer system of the centers.

**RESULTS:** One hundred patients completed the questionnaire and their HbA1c and cholesterol levels were available in computer systems – 68% were males and more than 80% were above the age of 40 years. Mean HbA1c and cholesterol levels were found to be 8.31% and 185 mg/dL respectively. Mean DQOL score was found to be 31. SPSS v23 was used for inferential statistical analysis. Very weak, positive, non-significant correlation was found between DQOL and HbA1c (r=0.063, p=0.612). Very weak, negative, non-significant correlation was found between DQOL and cholesterol (r=-0.150, p=0.226).

**CONCLUSION:** Although glycemic control was found to be generally poor among the patients, lipid control was within target range with good quality of life. However, no association was found between quality of life and glycemic and lipid control. Larger sample size may provide more reliable finding. Further data collection and analysis is underway.

## FAMILY MEDICINE

**175E. The effect of a practice-based multi-component intervention that includes health coaching on medication adherence and BP control in rural primary care** Jia-Rong Wu, Ph.D.[1], *Doyle Cummings, Pharm.D., FCP, FCCP*[2], Quefeng Li, Ph.D.[3], Jacqueline Halladay, MD, MPH[4], Katrina Donahue, MD, MPH[4], Crystal Cene, MD, MPH[4], Alan L. Hinderliter, MD[5], Hayden Bosworth, Ph.D.[6], Cassandra Miller, MPH[4], Beverly Garcia, MPH[4], Jim Tillman, DDiv[2], Darren DeWalt, MD, MPH[4]; [1]School of Nursing, University of North Carolina – Chapel Hill, Chapel Hill, NC [2]Department of Family Medicine, East Carolina University, Brody School of Medicine, Greenville, NC [3]Department of Biostatistics, University of North Carolina – Chapel Hill, Chapel Hill, NC [4]School of Medicine, University of North Carolina – Chapel Hill, Chapel Hill, NC [5]Division of Cardiology; School of Medicine, University of North Carolina, Chapel Hill, NC [6]School of Medicine, Duke University, Durham, NC

Presented at American Heart Association Council on Hypertension Annual Meeting, 2016.

**176E. Rural team-based diabetes care: telehealth achieves comparable outcomes as face-to-face care** Shivajirao Patil, MD, MPH, *Doyle Cummings, Pharm.D., FCP, FCCP*, Alyssa Adams, MPH, Lisa

Rodebaugh, BSN, Dennis Russo, Ph.D., Jill Jennings, MS, Jessica Sisneros, MS, Ann Marie Nye, Pharm.D.; Department of Family Medicine, East Carolina University, Brody School of Medicine, Greenville, NC

Presented at America Diabetes Association, Annual Scientific Sessions, June 2017.

**177. Refinement and validation of the clinical pharmacy priority (cp2) score to focus clinical pharmacy services in family medicine** *Joseph Vande Griend, Pharm.D.*[1], Joseph Saseen, Pharm.D.[2], Heather Anderson, Ph.D.[3]; [1]Population Health Services Organization, University of Colorado Health, Aurora, CO [2]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO [3]Department of Clinical Pharmacy, University of Colorado Denver Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

**INTRODUCTION:** The Clinical Pharmacy Priority (CP2) Score includes 11 patient-specific demographic and clinical characteristics. As the CP2 score increases, patients are more likely to have a medication-related problem (MRP). However, it does not differentiate as well among highly complex patients.

**RESEARCH QUESTION OR HYPOTHESIS:** We hypothesized that a refined, validated CP2 tool would further differentiate presence of MRP among complex patients.

**STUDY DESIGN:** Expert consensus; validity and reliability assessment using a retrospective cohort.

**METHODS:** An expert panel of board-eligible clinical pharmacists from family medicine residency programs in Idaho, Utah, and Colorado used a modified-Delphi method to identify patient-specific elements believed important for predicting MRPs. A retrospective cohort of 300 adult patients aged 40-89 years with broad but equal distribution of elements was identified. A second expert panel of board-eligible clinical pharmacists developed consensus on the presence and importance of MRPs for this cohort. Logistic regression estimated the association between count of elements and having an MRP. Sensitivity and positive predictive value (PPV) were used to inform a potential cut-off for number of patient-elements to identify patients most likely to have an MRP.

**RESULTS:** 22 patient-specific elements were identified and incorporated into the refined CP2 score. With each additional element, the risk of having an MRP doubled (odds ratio=2.2, 95% confidence interval=1.76-2.81). Based on a balance between sensitivity and PPV, a total of 5 elements was chosen as the appropriate cut-off for identifying patients likely to have a MRP. 99% of patients with ≥5 elements had a MRP (PPV=99%); among patients with an MRP, 74% had ≥5 elements (sensitivity=75%).

**CONCLUSION:** The refined CP2 Score contained additional elements compared to the original CP2 score. A total of 5 or more elements differentiated between patients with and without MRPs. Further research evaluating the contribution of the 22 patient-specific elements to important healthcare outcomes is needed.

**178E. If the gene fits: perspectives of pharmacogenomic use in family medicine practices** *Sara Weinstein, Pharm.D.*[1], Patricia Klatt, Pharm.D., BCPS[1], Sejla Jukic, BS[2], Melissa McGivney, Pharm.D.[2], Sophia Cothrel, BS[2], Megan Baumgartner, Pharm.D., BCPS[1], Joni Carroll, Pharm.D.[2]; [1]UPMC St. Margaret, Pittsburgh, PA [2]University of Pittsburgh School of Pharmacy, Pittsburgh, PA

Presented at the Society of Teachers of Family Medicine (STFM), Washington, DC, May 8, 2018.

**179. The association between health literacy and medication literacy of parent-child dyads in a rural underserved population** *Takova Wallace, Pharm.D., BCACP*[1], Gabriela Orsak, MS, Ph.D.[2]; [1]Department of Clinical Pharmacy, The University of Texas at Tyler, Tyler, TX [2]The University of Texas Health Science Center Northeast, Tyler, TX

**INTRODUCTION:** Health literacy of children spans a continuum over time and is often reflective of the parent or caregiver's level of health literacy. This project aims to address health and medication literacy in the child and the parent, thus addressing two populations at once and assessing the correlation between the parent-child dyad.

**RESEARCH QUESTION OR HYPOTHESIS:** There is a positive correlation between parent and child health literacy status, and that parental health literacy is directly associated with medication literacy in children.

**STUDY DESIGN:** A prospective correlation analysis conducted utilizing survey tools within an independent school district.

**METHODS:** Within the selected school district, potential child participants were identified and the primary health-related caregiver will complete the dyad for each child. Parents and children completed health and medication literacy assessments administered by trained investigators. Health literacy assessments include the Rapid Estimate of Adult Literacy in Medicine-Short Form (REALM-SF) and the Rapid Estimate of Adolescent Literacy in Medicine-Short Form (REALM-TeenS) for adults and children, respectively. Medication literacy will be assessed using the Medication Literacy Assessment-Spanish and Englis (MedLitRXSE) tool.

**RESULTS:** A total of 11 dyads were assessed. The average age of parents and children was 43 and 11 years, respectively. The average REALM-SF score was 6.64 (SD = .67). The average MedLitRX score was 10.18 (SD = 2.36). Child age had no relationship to medication literacy scores of parents, $p > .05$. However, parental insurance status was significantly related to medication literacy, after controlling for number of comorbidities, B = 3.96, $p = .017$, partial $\eta^2 = .73$. Specifically, among parents, medication literacy scores were higher for the insured. On the other hand, parental insurance status had no effect on child medication literacy scores, $p > .05$.

**CONCLUSION:** Correlations between health literacy of the dyad were difficult to reveal; however, limited parental insurance status was shown to be related to lower medication literacy.

**180. Determinants of vaccine hesitancy in a low income urban population** Joseph Martin, Pharm.D.[1], *Kathleen Pincus, Pharm.D., BCPS*[2],

Leila Islam, Ph.D.[3]; [1]University of Maryland School of Pharmacy, Baltimore, MD [2]Department of Pharmacy Practice and Science, University of Maryland School of Pharmacy, Baltimore, MD [3]Virginia Commonwealth University School of Medicine, Richmond, VA

**INTRODUCTION:** Vaccinations provide well-established public health benefits, but adult vaccination rates remain low. Pharmacists play a crucial role in improving adult vaccination rates in a variety of clinical settings. The World Health Organization (WHO) has developed survey questions to evaluate the multi-factorial determinants of vaccine hesitancy in various populations.

**RESEARCH QUESTION OR HYPOTHESIS:** Which domains contribute to vaccine hesitancy in in an urban, low-income setting?

**STUDY DESIGN:** Descriptive, single-site, prospective survey study design.

**METHODS:** Questions from the WHO's Appendices to the Report of the SAGE Working Group on Vaccine Hesitancy were adapted for survey delivery and administered to adult patients seen at a Family Medicine practice from 2/1/17-6/30/17. Responses were evaluated using descriptive analysis to characterize local determinants of vaccine hesitancy.

**RESULTS:** Participants were mainly female (69%), African-American (73%), age of 18 and 40 (50%), with medical assistance or Medicare (63%). Forty-eight participants completed the survey. Over a third of participants (38%) reported delaying or declining vaccinations due to adverse reactions, and 48% reported a belief in better ways to prevent diseases than with vaccines. A majority of respondents indicated trust in pharmaceutical companies to provide safe and effective vaccines (79%). Only one respondent experienced advocacy against vaccination by their religious community (2%). Responses to governmental influences were divided. Most of the respondent's reported trust in doctors for information about vaccinations (85%).

**CONCLUSION:** This study provides insight on motivators and determinants of vaccine hesitancy in a low-income, urban, insured patient population. Influences such as religion, government, and views on pharmaceutical companies did not contribute substantially to vaccine hesitancy in this population. Fear of adverse effects and beliefs in alternative strategies to prevent disease may contribute to vaccine hesitancy. Targeting vaccine-related education toward population-specific contributors to vaccine hesitancy may help pharmacists improve adult vaccination rates.

**181. Assessment of family medicine resident physicians' medication knowledge improvement after a required pharmacotherapy rotation**

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**INTRODUCTION:** Minimal literature exists regarding effectiveness of education of family medicine physician residents by clinical pharmacists. A unique required 4-week pharmacotherapy rotation, precepted only by clinical pharmacists, is completed by family medicine physician residents during their second year of residency at our family medicine residency program. We evaluated the knowledge outcomes of this rotation.

**RESEARCH QUESTION OR HYPOTHESIS:** Does family medicine physician resident's medication knowledge and confidence improve overall and in each specific content area after completing a required 4-week pharmacotherapy rotation?

**STUDY DESIGN:** This was an observational, single group pre/post study.

**METHODS:** At the beginning and end of their pharmacotherapy rotation, residents completed the same 29-question test on medication knowledge, and self-rated their confidence in medication-related knowledge and skills. The primary objectives of the study were to determine if family medicine residents' medication knowledge in general and specific content areas improved from baseline to end of their rotation. Data were analyzed using SPSS v. 25. Differences between pre- and post-test were explored using correlated means t-tests.

**RESULTS:** Between September 2015 and May 2018, 21 residents completed the pharmacotherapy rotation. The overall mean score of pharmacotherapy knowledge improved significantly from baseline to end (15.7 [54.2%] vs. 22.4 [77.2%]; $p < 0.001$). The scores in each specific content area also improved significantly for diabetes ($p < 0.001$), pulmonary ($p < 0.001$), smoking cessation ($p = 0.014$), anticoagulation ($p < 0.001$), preventive medicine ($p = 0.012$), pharmacokinetics ($p = 0.009$), and prescribing practices ($p = 0.001$). Additionally, resident confidence in medication knowledge also improved significantly from baseline to end ($p < 0.001$).

**CONCLUSION:** A required 4-week pharmacotherapy rotation during family medicine physician residents' second year significantly improved medication knowledge and confidence as shown by pre- and post-testing. This study is an important addition to the existing literature.

## GASTROENTEROLOGY

**182. Efficacy and safety of direct acting antivirals (DAAs) in an urban clinical setting**

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**INTRODUCTION:** Development of novel direct acting antivirals (DAAs) has led to >95% sustained virological response rates (SVR12) in patients with hepatitis C virus (HCV) in large controlled clinical trials.

**RESEARCH QUESTION OR HYPOTHESIS:** Our goal was to evaluate the safety and efficacy of DAAs in a non-controlled urban clinical setting and to compare our results to those reported in large clinical trials.

**STUDY DESIGN:** Retrospective cohort study.

**METHODS:** All patients who initiated on DAAs between March 2015 and January 2018 were retrospectively evaluated. The primary endpoint was the proportion of patients achieving SVR12. Descriptive statistics were used to analyze the results. Bivariate associations between patients achieving treatment success and demographic and clinical variables were conducted using chi-square, Fisher's exact test, and independent samples t-test with a two-sided alpha value of 0.05.

**RESULTS:** Among 47 patients with HCV who were initiated on DAAs (80% male, 83% African Americans, 86% genotype 1, 94% treatment-naïve), 30% had cirrhosis and 68% were co-infected with HIV. Ledipasvir/sofosbuvir (LDV/SOF), elbasvir/grazoprevir (ELB/GRA), sofosbuvir/velpatasvir (SOF/VEL), and ombitasvir/paritaprevir/ritonavir + dasabuvir (OBV/PTV/r + DSV) were utilized in 62%, 17%, 13%, and 8% of patients, respectively. Of the 47 patients initiated on therapy, 2 were lost to follow-up and SVR12 results are not yet available for 10 patients. Of the 35 patients who completed therapy and for whom SVR12 results are available, 32 (91%) achieved SVR12 and 3 (9%) failed treatment. There were significant associations between treatment failure and cirrhosis status (p=0.018) and race (p=0.029). No other bivariate associations were found. None of the patients reported adverse events related to DAA therapy and no laboratory abnormalities were noted.

**CONCLUSION:** Findings from our small urban clinic cohort indicate that the administration of DAAs is well-tolerated and leads to excellent SVR12 rates, albeit, not the >95% rates seen in large controlled clinical trials.

**183E. Safety and efficacy at 1 year after switching from tenofovir disoproxil fumarate to tenofovir alafenamide in chronic HBV patients with risk factors for TDF use** Edward Gane, MD[1], Wai-Kay Seto, MD[2], Harry Janssen, Ph.D., MD[3], Florin Caruntu, MD[4], Hyung Joon Kim, MD[5], Dzhamal Abdurakhmanov, MD[6], Shuhei Nishiguchi, MD[7], Ho Bae, MD[8], Shuyuan Mo, NA[9], Suri Vithika, NA[10], Anuj Gaggar, MD[10], John Flaherty, Pharm.D.[10], *EunYoung Lee, Pharm.D.*[9], Kao Jia-Horng, MD[11], Maurizia Brunetto, MD[12], Calvin Pan, MD[13], Maria Buti, MD[14]; [1]School of Medicine, The university of Auckland, Auckland, New Zealand [2]The University of Hong Kong, Hong Kong, Hong Kong [3]Division of Gastroenterology, Toronto Centre for Liver Disease Toronto General Hospital, Toronto, ON, Canada [4]Carol Davila University of Medicine and Pharmacy, Bucuresti, Romania [5]Chung-Ang University College of Medicine, Seoul, Korea, Republic of (South) [6]Sechenov University, Moscow,, Russian Federation [7]Medicine, Hyogo College of Medicine, Hyogo Prefecture, Japan [8]Asian Pacific Liver Center, Los Angeles, CA [9]Gilead Science, Foster City, CA [10]Gilead Sciences, Foster City, CA [11]National Taiwan University Hospital, Taipei, Taiwan [12]Azienda Ospedaliero Universitaria Pisana, Roma, Italy [13]NYU Langone Medical Center, NewYork, NY [14]Hopsital Universitario Valle Hebron, Barcelona, Spain

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**184. The use of immunosuppression in prevention of antibodies against anti-TNF therapy in inflammatory bowel disease** *Payal Kakadiya, Pharm.D., BCPS* and Teresa Potter, Pharm.D., BCPS, MPH; Department of Pharmacy, VCU Health, Richmond, VA

**INTRODUCTION:** Therapy with anti-TNF-α monoclonal antibodies plays an important role in maintaining remission in patients with inflammatory bowel disease (IBD). Infliximab (IFX) is chimeric, increasing its incidence of antibody development, whereas adalimumab (ADA), fully humanized, has a decreased risk of antibodies. Studies have shown reduction of antibody formation with the use of concurrent immunosuppressants such as 6-mercaptopurine, methotrexate, and azathioprine. However, current guidelines do not recommend the standardized use of immunosuppressants to prevent anti-drug antibody formation.

**RESEARCH QUESTION OR HYPOTHESIS:** The objective of this investigation was to determine if concurrent immunosuppression is associated with a decrease in drug antibody formation and to compare the development of antibodies to IFX to that of ADA.

**STUDY DESIGN:** A single-center, retrospective, observational cohort study was performed. The patient population included patients followed at the VCU Health Ambulatory Care Center by the Gastroenterology Clinic from January 1, 2016 to December 31, 2016.

**METHODS:** The inclusion criteria were age ≥ 18 years with a diagnosis of Crohn's disease or ulcerative colitis who have received IFX or ADA with reported serum drug levels and antibody levels. The primary outcome was to evaluate the effectiveness of concurrent immunosuppression in preventing the formation of drug antibodies and to determine incidence of drug antibodies to IFX compared to ADA.

**RESULTS:** In the ADA group, 80.6% of patients experienced no response, of which 52% had developed antibodies. Only 16 patients were on immunosuppression with 50% developing antibodies (p=1). In the IFX group, 73.7% had a no response with 64.3% of patients having developed antibodies. Nine patients were on immunosuppressive therapy of which 33.3% had detectable antibodies (p=0.63).

**CONCLUSION:** The addition of immunosuppression to anti-TNF therapy did not show statistical significance in preventing the formation of antibodies in either the infliximab or adalimumab group.

## GERIATRICS

**185. Potentially inappropriate prescribing in hospitalized older adult high cost healthcare users** *Monica Sanh, Pharm.D.*[1], Justin Lee, BScPhm, MD[2], Anne Holbrook, MD, Pharm.D., MSc[3], Peter Macdonald, D.Phil, P.Stat[4]; [1]Department of Pharmacy, North York General Hospital, North York, ON, Canada [2]Department of Medicine, Division of Geriatric Medicine, McMaster University, Hamilton, ON, Canada [3]Department of Medicine, Division of Clinical Pharmacology and Toxicology, McMaster University, Hamilton, ON, Canada [4]Department of Mathematics and Statistics, McMaster University, Hamilton, ON, Canada

**INTRODUCTION:** High cost healthcare users (HCUs) are a small proportion of the population who use a disproportionate amount of

healthcare resources. Medications are an important contributor to HCU costs, but it is unclear to what extent poor quality, including potentially inappropriate prescribing (PIP), may be contributing to HCU adverse outcomes and costs. PIP includes potentially inappropriate medications (PIMs) and potential prescribing omissions (PPOs). The STOPP/START criteria are validated tools to assess PIP in older adults.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the prevalence and types of PIP in older adults HCUs?

**STUDY DESIGN:** Retrospective case series

**METHODS:** We conducted chart reviews of older adult HCUs admitted to General Internal Medicine at two academic hospitals in Hamilton, Canada during fiscal year 2015-2016. HCUs were defined as patients with at least 5 emergency department visits and 2 hospitalizations in the past year. Home medications taken prior to admission were reviewed applying STOPP/START criteria plus four additional pre-specified PIM criteria. Home and discharge medications were reconciled to determine the proportion of PIPs addressed by hospital discharge. Log-linear regression was used to characterize the relationship between PIPs and future healthcare utilization.

**RESULTS:** Of 243 HCUs identified, we randomly selected 100 for review. Eighty-nine (89%) had at least one PIP. The most frequent therapeutic classes implicated were anticoagulants/antiplatelets, ACE inhibitors, benzodiazepines, opioids, and stool-softeners. PPOs were a significant predictor of ED visits in the next year ($\beta$=0.36, p< 0.001), but not hospitalizations (p=0.06). PIPs and PIMs were not significant predictors of ED visits or hospitalizations. Only 14% of PIPs were resolved by hospital discharge.

**CONCLUSION:** Most older adult HCUs were not optimized on appropriate, evidence-based medications at hospital admission. Opportunities to address PIP during hospitalization were frequently missed. Trials of interventions to optimize medications in HCUs are needed to see if clinical outcomes and cost-effectiveness can be improved.

**186. Resident perceptions of using telemedicine for resident-pharmacist communication in the nursing home** *Hannah Akerberg, Pharm. D. – Anticipated 2020*[1], Adrian Wong, Pharm.D., MPH[2], Maureen Reynolds, Ph.D.[2], Monica Aspinall, Pharm.D.[3], Megan Pellett, Pharm. D.[3], Richard Boyce, Ph.D.[2], Colleen Culley, Pharm.D.[2], Gabrielle Dziuba, N/A[2], Steven Handler, MD, Ph.D., CMD[2], John Kellum, MD[2], Subashan Perera, Ph.D.[2], Sandra Kane-Gill, Pharm.D., MS, FCCM, FCCP[4]; [1]School of Pharmacy, University of Pittsburgh, Pittsburgh, PA [2]University of Pittsburgh, Pittsburgh, PA [3]RxPartners-LTC, Pittsburgh, PA [4]Department of Pharmacy and Therapeutics, University of Pittsburgh School of Pharmacy, Pittsburgh, PA

**INTRODUCTION:** Telemedicine is a growing area of healthcare that has shown to improve patient outcomes. Limited information exists on the role of pharmacist-led telemedicine in the nursing home (NH), despite the potential to reduce adverse drug events (ADEs). Limited interactions of NH residents currently exist with pharmacists, therefore, evaluation of communication preferences is necessary for effectiveness. Therefore, we performed a survey to determine NH resident perceptions towards use of telemedicine for communication with pharmacists.

**RESEARCH QUESTION OR HYPOTHESIS:** Resident preference for communication with a pharmacist in the NH via telemedicine will increase after exposure to telemedicine.

**STUDY DESIGN:** A survey was administered to residents admitted to NHs within our health system in conjunction with a telemedicine intervention. This intervention was focused on residents receiving high-risk medications and included education of ADE-related symptoms.

**METHODS:** Residents were surveyed in the pre- and post-intervention periods, with those exposed to telemedicine defined as cases. The primary outcome was the resident's preference for communicating with a pharmacist (telemedicine, in-person, either). Residents were included if they had preserved cognitive function, evidenced by the Brief Interview for Mental Status and the Confusion Assessment Method. A chi-square test was used to test the difference in communication preferences, performed using R version 3.3.3.

**RESULTS:** A total of 835 residents (case: n=412; control: n=423) met inclusion criteria. Preference for in-person communication was lower in cases than controls (34.7% vs. 53.0%, p<0.001), while preference for telemedicine and either method was higher. Resident exposure to pharmacists in the NH increased from 3.5% to 72.7% (p<0.001), which was made possible through the use of telemedicine.

**CONCLUSION:** Resident preference to interact with consultant pharmacists increased for telemedicine throughout this study. Future studies are needed to determine the impact of pharmacist telemedicine on patient outcomes such as a decreased rate of ADEs.

**187. Utilization of potentially inappropriate medication in nursing home residents** Duygu Handan Peskircioglu, B.S. Pharm, *Beyza Torun, B.S. Pharm, Ph.D Student*, Oznur Ozkan, B.S. Pharm, Ph.D Student, Mesut Sancar, Prof. and Betul Okuyan, Assoc. Prof.; Clinical Pharmacy Department, Marmara University- Faculty of Pharmacy, Istanbul, Turkey

**INTRODUCTION:** The aim of the study is to evaluate potentially inappropriate medication utilization at nursing home.

**RESEARCH QUESTION OR HYPOTHESIS:** Is there any potientially inappropriate medication utilization according to 'Norwegian General Practice-Nursing Home (NORGEP-NH) criteria' at a nursing home in Istanbul?

**STUDY DESIGN:** This study was conducted in a nursing home located in Istanbul, Turkey. Nursing home residents who were ≥65 years and used at least one medication regularly were included this study.

**METHODS:** Demographic characteristics and medical history of patients have been retrospectively collected. Potentially inappropriate medication uses of patients were evaluated by using 'Norwegian General Practice-Nursing Home (NORGEP-NH) criteria'.

**RESULTS:** Among total of 88 individuals (21 male, 67 female), the mean of age was calculated as 85.0±7.8 (min-max: 65.0-106.0). The mean of participants' education year was 9.7±3.9. It was detected that the mean of participants' comorbidities was 5.3±2.3. The mean

of NORGEP-NH total criteria score was calculated as 5.5 ±3.1 (min-max: 1.0-14.00). There was a difference between the genders in the mean of NORGEP-NH total criteria score (6.0 ± 3.1 in female versus 4.0 ± 2.5 in men; p<0.05). The NORGEP-NH total criteria score was not found statistically correlated with age (p>0.05). However; there was a statistically significant correlation between NORGEP-NH total criteria score and the number of comorbidities (r=0.301; p<0.05).

**CONCLUSION:** As a conclusion, all nursing home residents utilized at least one potential inappropriate medication and the usage of potential inappropriate medication was generally very high. Involvement of clinical pharmacist in healthcare team would be essential at nursing home. Clinical pharmacist would perform medication review to detect potential inappropriate medications in nursing home residents.

**188. Potentially inappropriate prescribing in people with dementia: an Australian population-based study** *Tesfahun Eshetie, MSc*, Tuan Nguyen, Ph.D., Marianne Gillam, Ph.D., Lisa Kalisch Ellett, Ph.D.; School of Pharmacy and Medical Sciences, University of South Australia, Adelaide, Australia

**INTRODUCTION:** International studies have shown the prevalence of potentially inappropriate prescribing (PIP) in people with dementia is between 15% and 64% and that PIP is associated with adverse outcomes. There are limited Australian studies on the topic.

**RESEARCH QUESTION OR HYPOTHESIS:** To assess the prevalence of PIP among people dispensed medicines for dementia compared to people never dispensed medicines for dementia.

**STUDY DESIGN:** A retrospective cohort study was conducted using the Australian Pharmaceutical Benefits Scheme 10% sample of pharmacy claims.

**METHODS:** People with dementia were defined as those dispensed a medicine for dementia (cholinesterase inhibitor, memantine or risperidone for behavioural and psychological symptoms of dementia) between 12 August 2003 and 31 December 2015, aged ≥ 65 years and alive at the end of 2016. An age and gender- matched comparison cohort (5:1) of people never dispensed medicines for dementia was identified. PIP was defined using the Screening Tool of Older Person's Prescriptions (STOPP) criteria, and PIP prevalence was determined between 1 January 2016 and 31 December 2016.

**RESULTS:** 8280 people dispensed medicines for dementia and 41400 comparisons never dispensed medicines for dementia were included: 63% were female and the median age was 82 years. PIP prevalence was 79% amongst people with dementia compared to 70% amongst the comparison group (p<0.0001). The most prevalent STOPP criteria in people with dementia were use of anticholinergics (38%), high-dose proton pump inhibitors for >8 weeks (37.7%), and use of benzodiazepines for ≥4 weeks (27.4%). After adjustments for age, gender, comorbidity and number of prescribers, people with dementia were more likely to be exposed to PIP than comparisons (adjusted OR 1.44, 95% CI: 1.35-1.53, p<0.0001).

**CONCLUSION:** Potentially inappropriate prescribing was more common in people dispensed medicines for dementia than comparisons. These results highlight the need for effective interventions to optimise prescribing in people with dementia.

**189. Potentially inappropriate prescribing before and after initiation of anti-dementia medicines: an australian population-based study** *Tesfahun Eshetie, MSc*, Tuan Nguyen, Ph.D., Marianne Gillam, Ph.D., Lisa Kalisch Ellett, Ph.D.; School of Pharmacy and Medical Sciences, University of South Australia, Adelaide, Australia

**INTRODUCTION:** Potentially inappropriate prescribing (PIP) is one of the core issues in the quality use of medicines and is associated with numerous negative health outcomes. Despite the broader concept of PIP, previous studies assessing PIP pre- and post-initiation of anti-dementia medicines have focused on limited class of medicines.

**RESEARCH QUESTION OR HYPOTHESIS:** Is there an improvement in the quality use of medicines post-initiation versus pre-initiation of anti-dementia medicines (measured by prevalence of PIP)?

**STUDY DESIGN:** A retrospective cohort study was conducted using the Australian Pharmaceutical Benefits Scheme 10% sample of pharmacy claims.

**METHODS:** People with their first claim for dispensing of anti-dementia medicines (cholinesterase inhibitor (ChEIs) or memantine) between 1 January 2015 and 31 December 2015, aged ≥ 65 years and alive at the end of 2016 were included. The index date was defined as the date of first supply of anti-dementia medicines. PIP was identified using the Screening Tool of Older Person's Prescriptions (STOPP) criteria, and PIP prevalence was compared in the 12-month period prior to and post-initiation of anti-dementia medicines. The McNemar's test was used to test differences in the prevalence of PIP between the two time periods.

**RESULTS:** A total of 1176 patients were included in the study: 60% were female and the median age was 80 years. Overall PIP prevalence was 85% in the 12-month period prior to initiation of ChEIs or memantine compared to 89% in the 12-month period post initiation (p<0.0001). The median number of STOPP criteria was 2(interquartile range 1-4) in the 12-months prior to initiation of anti-dementia medicines, increasing to 3(2-4) in the 12-months post-initiation.

**CONCLUSION:** Potentially inappropriate prescribing was common in people dispensed medicines for dementia, with a significant increase in prevalence after initiation of anti-dementia medicines compared to prior.

**190. Prevalence and predictors of high anticholinergic burden in older adults: a nation-wide population study** *Ju-Yeun Lee, Ph.D.*[1], Kwanghee Jun, MS[2], Young Mi Ah, Ph.D.[1], Sunghee Hwang, BS[2], Jee Eun Chung, Ph.D[2]; [1]College of Pharmacy and Research Institute of Pharmaceutical Sciences, Seoul National University, Seoul, Korea, Republic of (South) [2]College of Pharmacy, Hanyang University, Gyeonggi-do, Korea, Republic of (South)

**INTRODUCTION:** Despite the well-known untoward adverse effects, medications with anticholinergics properties are prescribed widespread among older adults. However, limited studies estimated

nation-wide anticholinergic burden among older adults. We aimed to measure the anticholinergic burden and to identify predictive factors for high anticholinergic burden in the nation-wide older adult cohort.

**RESEARCH QUESTION OR HYPOTHESIS:** High anticholinergic burden in older adults are associated with demographic, disease, and healthcare utility pattern.

**STUDY DESIGN:** Cross-sectional analysis

**METHODS:** For this study, Aged Patient Sample of National Health Insurance claims data in 2016 was used. We modified Anticholinergic Drug Scale (ADS) to include anticholinergic drugs that were omitted in the original list but were available in Korea. WHO-defined daily dosage were used to measure dose standardized anticholinergic burden. High anticholinergic burden was defined as average daily dose standardized ADS score ≥ 3 or maximum ADS score of concurrent chronic medications ≥ 3. Predictors for high anticholinergic burden were identified using multivariate logistic regression.

**RESULTS:** A total of 1,285,101 patients were included for the analysis. The average age was 73.7±6.6 years, male patients comprised 41.4%, Charson Comorbidity Index (CCI) score was 2.5±2.4 on average. Polypharmacy (≥ 5 chronic medications) and excessive polypharmacy (≥ 10 chronic medications) were observed in 19.3% and 6.6%, respectively. High anticholinergic burden was observed in 337,720 patients (26.3%) and were strongly associated with age ≥ 85 years, female, CCI score ≥ 3, polypharmacy, depression, urinary incontinence or overactive bladder, Parkinson disease, schizophrenia, frequency of healthcare visit. The major drugs contributing to anticholinergic burden were ranitidine, chlorpheniramine, dimenhydrinate, and solifenacin.

**CONCLUSION:** This study showed that one out of five Korean older adults were exposed to high anticholinergic burden and patients with polypharmacy, high co-morbidities, specific co-morbid disease such as depression, urinary incontinence, Parkinson disease, schizophrenia, and frequent healthcare visit were at high risk.

**191. Longitudinal changes in anticholinergics, sedatives and antipsychotic medication use before and after diagnosing dementia** *Young-Mi Ah, Ph.D*[1], Euna Han, Ph.D[2], Kwanghee Jun, the master's course[3], Sunghee Hwang, Ph.D candidate[4], Ju-Yeun Lee, Ph.D.[3]; [1]College of Pharmacy, Yeungnam University, Gyeongsangbuk, Korea, Republic of (South) [2]College of Pharmacy, Yonsei University, Incheon, Korea, Republic of (South) [3]College of Pharmacy and Research Institute of Pharmaceutical Sciences, Seoul National University, Seoul, Korea, Republic of (South) [4]College of Pharmacy, Hanyang University, Gyeonggi-do, Korea, Republic of (South)

**INTRODUCTION:** Guidelines recommend against the use of drugs with anticholinergic or sedative properties, and antipsychotics especially in people with Alzheimer's disease (AD). Limited researches evaluated the changes of the use of these medications following the dementia diagnosis. We aimed to assess the longitudinal change of anticholinergic, sedative, and antipsychotic medication use before and after diagnosis with dementia in comparison with non-dementia patients.

**RESEARCH QUESTION OR HYPOTHESIS:** Utilization pattern of specific medications may change after diagnosis with dementia

**STUDY DESIGN:** Longitudinal cohort study

**METHODS:** Patients with and without anti-dementia prescription (N= 3,684 for cases and N=13,913 for controls) from Korea National Health Insurance Service Senior Cohort (KNHIS-SC) database were included for analysis after propensity score matching. Yearly dose adjusted cumulative Anticholinergic Cognitive Burden score (ACB), sedative load, and WHO-defined daily dose (DDD) of antipsychotics were calculated. Multivariate log-normal mixed-effects regression was performed.

**RESULTS:** Yearly cumulative ACB, sedative load, and DDD of antipsychotics were higher in dementia patients than control both before and after diagnosis of dementia. The use of ACB and sedative load increased steadily and the use of antipsychotics were minimal in non-dementia patients during observation period. In patients with dementia, the use of each medication category peaked at index year and the elevation of that was significantly higher compared with the non-dementia patients. After dementia onset, ACB (approximately by 64 units) and sedative load (by 8.0 units) decreased while the use of antipsychotics (by 3.9 units) steadily increased compared to non-dementia patients.

**CONCLUSION:** The use of anticholinergics and sedatives was higher in dementia patients than non-dementia patients. It showed peak at the diagnosis of dementia, but decreased thereafter. However, the use of antipsychotics continued to rise after diagnosis of dementia.

**192. Antipsychotic use and effect on QTc intervals in elderly patients with delirium** Cyril Manuel Collantes, Pharm.D.[1], Aaron Pinkhasov, MD[2], Melissa Fazzari, Ph.D.[3], *Sum Lam, Pharm.D.*[4]; [1]Department of Pharmacy, NYU Winthrop Hospital, Mineola, NY [2]Department of Behavioral Sciences, NYU Winthrop Hospital, Mineola, NY [3]Department of Biostatistics, NYU Winthrop Hospital, Mineola, NY [4]College of Pharmacy and Health Sciences, St. John's University, Queens, NY

**INTRODUCTION:** Delirium is characterized by inattention, disorganized thinking, and altered level of consciousness, which may complicate hospital course. When delirium cause harms to patients or others, low doses of antipsychotics are often used in acute settings. Antipsychotics are known to increase mortality in elderly patients with dementia-related psychosis. Specifically, they are linked with QTc prolongation, torsade-de-pointes, and sudden cardiac death. Both delirium and cardiac outcomes are associated with advanced age.

**RESEARCH QUESTION OR HYPOTHESIS:** Is there a change in QTc intervals associated with antipsychotics use in delirious elderly patients?

**STUDY DESIGN:** A retrospective cohort chart review at a 600-bed teaching hospital.

**METHODS:** Subjects placed on constant observation from May to October 2015 were screened via a database at the behavioral health department. Included patients were 65 years or older and received antipsychotics for delirium management. Subjects were excluded if

they had insufficient documented EKGs or a pacemaker. QTc intervals prior to and post-treatment (2 – 10 days) were compared using two-sided paired t-test. Incidences of torsade-de-pointes and sudden cardiac death during hospital stay were recorded.

**RESULTS:** Of 485 patients screened, 68 met the study criteria. The overall elevation in QTc intervals from baseline was 17.5 ± 32.7 msec ($p < 0.001$). Increased QTc intervals were seen in all groups: haloperidol (n = 37, 24.2 ± 32.4 msec; $p < 0.001$), quetiapine (n = 29, 6.7 ± 30.6 msec; p = 0.25); risperidone (n = 2, 49.5 ± 21 msec). There were no incidence of torsade-de-pointes or sudden cardiac death.

**CONCLUSION:** Haloperidol for delirium in hospitalized elderly patients was associated with a statistically significant increase in QTc intervals from baseline. However, antipsychotic use did not lead to torsade-de-pointes or sudden cardiac death in delirious elderly patients during hospital stay in our acute care setting.

**193. An evaluation of potentially inappropriate medications for patients in bundled payment episodes in a skilled nursing facility** *Pooja Kirpekar*, *Pharm.D.*[1], Frank D'Amico, Ph.D.[2], Emily Kryger, Pharm.D., BCGP[3], Heather Sakely, Pharm.D., BCPS[4]; [1]UPMC St. Margaret, Pittsburgh, PA [2]Department of Biostatistics, UPMC St. Margaret, Pittsburgh, PA [3]UPMC, Pittsburgh, PA [4]Graduate Medical Education, UPMC St. Margaret, Pittsburgh, PA

**INTRODUCTION:** Medicare value-based healthcare reimbursement models seek to provide cost-effective, high-quality, coordinated care through use of healthcare teams, however, the role of a clinical pharmacist on the team is not clearly defined in current literature.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the prevalence of potentially inappropriate medication prescribing during the transition from hospital to skilled nursing facility in patients in bundled payment episodes?

**STUDY DESIGN:** Retrospective chart review.

**METHODS:** Patients discharged from a 250-bed hospital that is part of a larger health-system to one SNF with a geriatric trained pharmacist as part of the care team were reviewed. Patients were enrolled in the Comprehensive Care Joint Replacement (CJR) or Bundled Payments for Care Improvement (BPCI) reimbursement models during the study period. The Medication Appropriateness Index (MAI), a validated tool, measured potentially inappropriate medication prescribing at the time of SNF admission. The primary outcome is to determine the prevalence of inappropriate medication prescribing. The secondary outcomes are to descriptively analyze inappropriate prescribing and describe the population in these alternative payment models.

**RESULTS:** Sixty-seven patients were identified as being in bundled payment episodes from the study period of April 1, 2015 to April 30, 2017. Forty-eight patients met inclusion criteria. Most patients (81%; n=39) were female. The average age of patients was 84 years old. The mean Charlson Co-morbidity index score was 5.4 and patients had an average of 13 medications ordered at admission. Eighty-five percent of patients (41 out of 48 patients; 95% CI [72%, 94%]) had instances of potentially inappropriate medication prescribing. The mean MAI score was three.

**CONCLUSION:** The bundled payment patient population is complex due to age, co-morbid conditions, and polypharmacy. The MAI detected potentially inappropriate medication prescribing in post-acute care geriatric patients in bundled payment episodes illustrating that pharmacists may have a role in identifying inappropriate prescribing.

## HEALTH SERVICES RESEARCH

**194. Association between pharmacists' workload and performance of pharmaceutical care in taiwan** *Shih-Chieh Shao*, *MS*[1], Yuk-Ying Chan, MS[2], Hui-Yu Chen, MS[1], Edward Chia-Cheng Lai, Ph.D.[3]; [1]Department of Pharmacy, Keelung Chang Gung Memorial Hospital, Keelung, Taiwan [2]Department of Pharmacy, Linkou Chang Gung Memorial Hospital, Linkou, Taiwan [3]School of Pharmacy, Institute of Clinical Pharmacy and Pharmaceutical Sciences, College of Medicine, National Cheng Kung University, Tainan, Taiwan

**INTRODUCTION:** Pharmacists ensure the quality and safety of medication uses. However, dispensing overloaded was the top burden from pharmacists which was associated with work outcomes. To better understand the impacts of dispensing workload on pharmacists' performance, we required evidences from objective measurements such as drug dispensing and prescription reviews.

**RESEARCH QUESTION OR HYPOTHESIS:** We hypothesized higher pharmacists' workload may lead to poorer pharmaceutical care.

**STUDY DESIGN:** Observational study.

**METHODS:** We analyzed all reports about prescription suggestions and dispensing errors from electronic reporting systems (ERS) from Chang Gung Medical Foundation (CGMF) Hospitals between 2011 and 2016, which was the largest health system and consisted of 7 hospitals in Taiwan. We calculated the pharmacists' dispensing workload (PDW) as the number of prescriptions divided by the number of pharmacists' working days. We used the prescription suggestion rate (PSR) and dispensing error rate (DER) as outcome indicators for the performances of pharmacists' review and dispensing works respectively. Specifically, the PSR as the number of prescription suggestions divided by the number of pharmacists' working days and the DER as the number of dispensing errors divided by the number of pharmacists' working days. We determined the influences of PDW on the PSR and DER by generalized mixed effects models.

**RESULTS:** We included the total monthly number of 554 pharmacists (SD 22) which contributed to monthly 12,594 (SD 1,161) pharmacists' working days. The mean number of 731,329 (SD 48,493) prescriptions, and the mean PDW was 58 (SD 3) prescriptions in each month from 2011-2016. There was the significantly impact between PDW and PSR (coefficient: -0.020, P= 0.028) but not on DER (coefficient: -0.032, P= 0.174).

**CONCLUSION:** Dispensing workload negatively influenced on prescription suggestions from pharmacists, but not significantly related to dispensing errors. Our findings implicated that higher workload may interfere pharmacists' professions to ensure the quality of medication uses.

**195. Administration timing errors in inpatients in taiwan: multi-institutional study between 2015 and 2016** Hui-Yu Chen, MS[1], *Shih-Chieh Shao, MS*[1], Kai-Cheng Chang, MS[2]; [1]Department of Pharmacy, Keelung Chang Gung Memorial Hospital, Keelung, Taiwan [2]Department of Pharmacy, Linkou Chang Gung Memorial Hospital, Taoyuan, Taiwan

**INTRODUCTION:** Administration timing errors are common medication errors, but related studies are still lacking in Taiwan. This study focused on the rates of administration timing errors in parenteral drugs, and our findings could serve as hospital policy references regarding improvements in drug administration.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the rate of administration timing errors in parenteral drugs of inpatient settings in Taiwan?

**STUDY DESIGN:** Retrospective observational study

**METHODS:** This study used bar-code medication administration system (BCMA) records in parenteral drugs of inpatient settings between 2015 and 2016 from the 2 medical centers and 2 regional hospitals in Taiwan. We defined timing errors as the administration of drugs to patients earlier or later than 60 minutes for regular use cases, and later than 30 minutes for immediate use cases following doctors' orders. We also analyzed the rates of timing errors at different times of the workshift, and subgroup analyses included the rates of timing errors in different hospital levels.

**RESULTS:** We analyzed a total of 10,395,017 records from BCMA. The mean rate of administration timing errors was 7.0%. We found the highest rate of timing errors occurring during the evening shift (PM 4 – AM 0; 10.1%), followed by the night shift (AM 0 – AM 8; 7.2%) and morning shift (AM 8 – PM 4; 6.3%). In subgroup analyses, we found the overall rate of administration timing errors was similar (7.9% vs. 8.3%) between medical centers and regional hospitals, but it was higher in the night shift in regional hospitals (6.9% vs. 8.4%).

**CONCLUSION:** Administration timing errors in parenteral drugs of inpatient settings were common. Attention must be drawn to the higher rates of timing errors during the noon shift. Future studies evaluating the root causes of administration timing errors and their impact on patient care are warranted.

**196. Moderators of intervention effectiveness in a collaborative care model for type 2 diabetes** *Zheng Kang Lum, BSc (Pharm) (Hons)*[1], Jeffrey Jia Yeong Tan, MBChB, Dip (Family Med), Dip OM[2], Joyce Lee, Pharm.D., BCPS, BCACP[3]; [1]National University of Singapore, Singapore, Singapore [2]Keat Hong Family Medicine Clinic, Singapore, Singapore [3]Department of Pharmacy, Faculty of Science, National University of Singapore, Singapore, Singapore

**INTRODUCTION:** Implementation of collaborative care model in managing type 2 diabetes mellitus has been recommended by international guidelines. Literature has reported promising yet varying outcomes of this type of healthcare delivery model and the question of "*who actually benefited (more) from the collaborative care model?*" remained inadequately addressed. This study adopted moderation analysis to identify characteristics of individuals who benefited more from the collaborative care model in terms of change in HbA1c and diabetes-related distress levels.

**RESEARCH QUESTION OR HYPOTHESIS:** What are the characteristics of individuals with type 2 diabetes who were found to have improved HbA1c and diabetes-related distress when managed through the collaborative care model?

**STUDY DESIGN:** Moderation analysis was conducted according to MacArthur framework and Pincus et al. methodological criteria on a randomized controlled trial involving 441 individuals with type 2 diabetes.

**METHODS:** Individuals aged 21 years and above with HbA1c >7.0% (53.0 mmol/mol) and taking more than five chronic medications were randomized into collaborative care or physician-centred usual care. Baseline sociodemographic characteristics, medical and medication histories were obtained from electronic database. Diabetes-specific quality of life was assessed using the Audit of Diabetes-Dependent Quality of Life (ADDQoL), diabetes-related distress using Problem Areas in Diabetes (PAID). Medication adherence was self reported by participants. Johnson-Neyman technique and the pick-a-point approach were used to probe interactions.

**RESULTS:** Moderators of the intervention effect on change in HbA1c included diabetes-specific quality of life as measured by the average weighted impact of ADDQoL, using only oral hypoglycaemic agents (OHA) at baseline, and medication adherence. For change in diabetes-related distress, baseline number of co-morbidities and using only OHA were found to moderate the intervention effects.

**CONCLUSION:** This study was a novel application of moderation analysis. The incorporation of effective technique to identify beneficial characteristics is vital in advocating individualised care that yields significant positive outcomes.

**197. Evaluation of a meds-to-beds program on 30-day hospital readmissions** *Alan J. Zillich, Pharm.D.*[1], Hannah Davis, Pharm.D.[2], Wendy Lantaff, Pharm.D.[1], Jaclyn Myers, Pharm.D.[1], Susan Perkins, Ph.D.[3], Mu Shan, MS[3], Heather Jaynes, BSN[1], Margie E. Snyder, Pharm.D., MPH[4]; [1]Department of Pharmacy Practice, Purdue University College of Pharmacy, Indianapolis, IN [2]Department of Pharmacy, Indiana University Health-Arnett, Lafayette, IN [3]Division of Biostatistics, Indiana University School of Medicine, Indianapolis, IN [4]Department of Pharmcy Practice, Purdue University College of Pharmacy, Indianapolis, IN

**INTRODUCTION:** Transitions between care settings is a vulnerable period for patients. Effective programs for transitional care from hospital to home are needed to improve patient outcomes.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the effect of a bedside medication delivery program prior to discharge (i.e., "meds-to-beds") on 30-day all-cause hospital readmissions?

**STUDY DESIGN:** Retrospective, observational cohort study during a 1-year period in a medium size suburban health-system.

**METHODS:** The intervention cohort was defined as all hospitalized patients eligible for and opting into the meds-to-beds program. Eligibility criteria included all patientsdischarged to home from a general medical/surgical or intensive care unit and prescribed one or more new, regularly

scheduled, oral medications. The control cohort was defined as hospitalized patients eligible for the program who did not opt-in to receive it. Administrative data collected included 12-month healthcare utilization (e.g., inpatient, outpatient, and emergency department visits) prior to admission and 90-day healthcare utilization after discharge. The primary outcome was defined as 30-day all-cause re-hospitalization. A multivariate logistic regression model examined the likelihood of 30-day readmission between the intervention and control groups. Covariates in the model included age, gender, race, co-morbidities, healthcare utilization in the 12 months prior to admission, and readmission risk score.

**RESULTS:** Data were collected for 500 intervention and 1591 control patients. Both groups were similar with respect to age, gender, race, co-morbid conditions, and previous healthcare utilization. Readmission risk was higher in the intervention compared to the control group (7 vs. 6, p<0.001). The proportion of patients who were readmitted within 30 days was 5.2% in the intervention group and 6.2% in the control group. In the multivariate model, patients in the intervention group were less likely to re-admit within 30-days after discharge than patients in the control group, although the difference was not statistically significant (OR=0.68; 95% CI: 0.43-1.08, p=0.1).

**CONCLUSION:** The meds-to-bed program did not significantly reduce 30-day readmissions.

**198. Using diagnostic, utilization, and/or procedural code algorithms from administrative databases to discriminate between elective and non-elective percutaneous coronary interventions** *Catherine G. Derington, Pharm.D.*[1], Lauren J. Heath, Pharm.D.[2], David P. Kao, MD[3], Thomas Delate, Ph.D., MS[1]; [1]Department of Pharmacy, Kaiser Permanente Colorado, Aurora, CO [2]Department of Clinical Pharmacy, Kaiser Permanente Colorado, Aurora, CO [3]Department of Medicine, University of Colorado School of Medicine, Aurora, CO

**INTRODUCTION:** Elective percutaneous coronary interventions (PCIs) are difficult to discriminate from non-elective PCIs in administrative data. This limits the ability to track patient outcomes, ensure appropriate medical management, or perform research on patients who undergo elective PCI.

**RESEARCH QUESTION OR HYPOTHESIS:** Can algorithms using diagnostic, utilization, and/or procedural codes discriminate between elective and non-elective PCI?

**STUDY DESIGN:** Cross-sectional validation study

**METHODS:** An administrative healthcare utilization database at Kaiser Permanente Colorado, an integrated healthcare delivery system, was queried across 12 months to identify patients who were billed for a PCI. Random samples of cases were chart-reviewed manually by two trained clinical pharmacist reviewers (kappa coefficient = 0.85). Using clinical criteria, the reviewers classified each case as a valid PCI, then as an elective or non-elective. Cases were tested against nine algorithms containing diagnostic, utilization, and/or procedural codes. Performance statistics (sensitivity, specificity, positive predictive value [PPV], and negative predictive value [NPV]) and 95% confidence intervals (CI) using the Wilson Score method were calculated for each algorithm.

**RESULTS:** There were 521 PCI cases. Of these, 24 could not be validated, resulting in a final sample of 497 cases, representing 478 unique patients and 93 elective cases. The algorithm excluding cases with an acute myocardial infarction (AMI) diagnosis code within the 30 days prior to the PCI had the numerically highest performance statistics, overall, with sensitivity, specificity, PPV, and NPV of 89.4% (95%CI 31.4-52.2%), 79.2% (95%CI 74.9-83.0%), 50.0% (95%CI 42.2-57.8%), and 97.0% (95%CI 94.5-98.5%), respectively.

**CONCLUSION:** Elective and non-elective PCI were best discriminated in administrative data by excluding cases with an AMI diagnosis code within the 30 days prior to the PCI. While sensitivity, specificity, and NPV were high, this algorithm should be refined to further PPV. These algorithms need to be tested in other health-systems and research settings.

**199. Evaluation of anemia in communities served by shoulder to shoulder global in Santo Domingo, Ecuador** *Kevin Mercer, Pharm.D.*[1], Randall Knoebel, Pharm.D.[2], David Mannino, MD[3], Wayne Sanderson, Ph.D., MS[4], Melody Ryan, Pharm.D., MPH[5]; [1]Department of Pharmacy, The Johns Hopkins Hospital, Baltimore, MD [2]Department of Pharmacy, University of Chicago Medicine, Chicago, IL [3]Department of Preventive Medicine & Environmental Health, The University of Kentucky College of Public Health, Lexington, KY [4]Department of Epidemiology, The University of Kentucky College of Public Health, Lexington, KS [5]Department of Pharmacy Practice and Science, The University of Kentucky College of Pharmacy, Lexington, KY

**INTRODUCTION:** Shoulder to Shoulder Global (STSG) recognizes anemia as a cause of morbidity among patients in Santo Domingo, Ecuador. Little has been done to assess targetable risk factors to serve as a foundation for future pharmacotherapeutic interventions. This study sought to identify risk factors for anemia in this population.

**RESEARCH QUESTION OR HYPOTHESIS:** What factors are associated with anemia in Santo Domingo, Ecuador?

**STUDY DESIGN:** Retrospective, cohort study

**METHODS:** This study was declared exempt by the institutional review board. Data obtained from existing patient records from January 1, 2010 to August 31, 2016 included hemoglobin/hematocrit, age, sex, pregnancy status, and presenting community. Chi-square tests compared means to examine risk factors associated with anemia. Logistic regression and odds ratios (OR) were used to evaluate factors associated with anemia. Statistical analyses were performed with STATA.

**RESULTS:** Of the 1145 unique subjects, 42.8% were anemic, 33.0% were children under five, 67.2% were female, and 1.6% were pregnant. Subjects were distributed throughout seven communities; only 11.2% presented from an indigenous community. Presenting from the communities of Plan de Vivienda (OR=1.89; 95% CI [1.22, 2.84]), Los Naranjos (OR=2.28; 95% CI [123, 4.22]), or El Bua (OR=2.65; 95% CI [1.42, 4.94]) were risk factors for anemia. Compared to age under five years, all other age groups were protective for anemia (p≤0.001). Neither female sex (OR=1.02; 95% CI [0.77, 1.35]), nor pregnancy

(OR=1.42; 95% CI [0.54, 3.75]) was significantly associated with anemia.

**CONCLUSION:** Risk factors for anemia in this population have not previously been determined. In this study, risk factors were age group <5 years and presentation from select communities. A limitation of the study is its retrospective design. Additional research will evaluate the effectiveness of STSG health interventions on anemia.

**200. Discriminating dosing frequency from unstructured prescription sigs within electronic health record data** *Catherine G. Derington, Pharm.D.*, Jordan B. King, Pharm.D., MS; Department of Pharmacy, Kaiser Permanente Colorado, Aurora, CO

**INTRODUCTION:** Clinical care relies on clearly communicating how patients take their medications, including dose, route, frequency, and duration. However, outcomes research has been challenged with researching real-world medication use because prescription administration directions in the *signatura* (i.e., "sig") are stored in unstructured, free-text strings within the electronic health record (EHR). Consequently, estimating a patient's dosing frequency is difficult, and methods to extract this data are needed.

**RESEARCH QUESTION OR HYPOTHESIS:** We developed a text processing technique to discriminate daily dosing frequency within EHR data.

**STUDY DESIGN:** Retrospective, validation study

**METHODS:** Lisinopril was used as a case study to develop the algorithm in a step-wise fashion from sigs contained in the EHR from the month of January 2017 in Kaiser Permanente Colorado. Steps included: 1) standardization of text (e.g., capitalization, spelling); 2) parsing the sig to identify frequency; 3) iterative modification based on identification of errors; 4) validation in sig data from February 2017. The primary outcome was the positive predictive value (PPV) of the algorithm calculated by dividing the number of prescriptions assigned the correct frequency (true positive) by the total number of results from the algorithm.

**RESULTS:** There were 1,714 lisinopril prescriptions dispensed in February with 1,568 distinct, unique sigs. Most of the sigs represented once-daily dosing frequency (91.2%); the remainder were twice-daily dosing (7.9%) or other frequencies (0.9%; e.g., every-other-day or three times daily). The PPV was 99.2%; only 14 sigs were misclassified by the algorithm. Qualitatively, sigs commonly misclassified by the algorithm were due to spelling errors or word choice (e.g., "supper" instead of "evening").

**CONCLUSION:** Even for a simple, commonly-used oral medication, prescription sigs are complex, with hundreds of ways to describe each dosing frequency. Algorithms with high PPV can be developed and refined to analyze components of prescription sigs to extract variables of interest.

## HEMATOLOGY/ANTICOAGULATION

**201. Risk factors of vitamin d deficiency in sickle cell disease** *Jin Han, Pharm.D., Ph.D.*[1], Xu Zhang, Ph.D.[2], Santosh Saraf, MD[2], Michel Gowhari, DO[2], Robert Molokie, MD[2], Joharah Hassan, MD[2], Shivi Jain, MD[2], Taimur Abbasi, MD[2], Roberto Machado, MD[3], Victor Gordeuk, MD[2]; [1]Department of Pharmacy Practice, College of Pharmacy, University of Illinois at Chicago, Chicago, IL [2]Section of Hematology/Oncology, Department of Medicine, University of Illinois at Chicago, Chicago, IL [3]Division of Pulmonary, Critical Care, Sleep, and Occupational Medicine, Indiana University, Indianapolis, IN

**INTRODUCTION:** Vitamin D deficiency (VDD), defined as 25-OHD levels <20 ng/mL, is prevalent among patients with sickle cell disease (SCD), and it is linked to acute/chronic pain and bone fracture in this patient population. There is limited literature studying risk factors associated with the development of VDD in SCD.

**RESEARCH QUESTION OR HYPOTHESIS:** To investigate risk factors of VDD in SCD.

**STUDY DESIGN:** A cross-sectional study of risk factors associated with VDD in SCD patients.

**METHODS:** We examined clinical and genomic parameters associated with VDD in 335 adults with SCD. We compared 25-OHD levels in SCD to the general African-American population in the National Health and Nutrition Examination Survey (NHANES), and analyzed the expression of genes involved in vitamin D metabolism.

**RESULTS:** The 25-OHD levels were independently associated with older age (coefficient 0.018, 95% CI: 0.013-0.024, $p < 0.001$) and vitamin D supplementation (coefficient 0.334, 95% CI: 0.166-0.503, $p < 0.001$) in the adult SCD patients. The 25-OHD levels were greater in SCD patients over 40 years of age compared to the general African-American population in this age range. There were seasonal variations in 25-OHD levels in SCD patients with the lowest levels during the months with least daylight (November to January). Lower 25-OHD level was associated with increased expression of cytochrome P450 3A4 (*CYP3A4)* and decreased expression of vitamin D binding protein (*DBP)*, two genes involved in vitamin D metabolism pathways, in SCD. Weekly oral ergocalciferol supplementation significantly improved 25-OHD levels (median 10 vs. 23 ng/mL, $p < 0.001$).

**CONCLUSION:** We found VDD to be associated with younger age in adult patients with SCD, emphasizing the importance of supplementing vitamin D in the age group of 18-40 years old. Lack of sun exposure and differential gene expression of *CYP3A4* and *DBP* also may contribute to VDD in this patient population.

**202E. Interim report on the ANNEXA-4: andexanet for reversal of anticoagulation in factor Xa-associated acute major bleeding** Stuart J. Connolly, MD, FRCPC[1], Mark Crowther, MD, MSc, FRCPC[1], Truman J. Milling, MD, FACEP[2], John W. Eikelboom, MD[1], C. Michael Gibson, MD[3], Andrew Demchuk, MD[4], Patrick Yue, MD[5], Michele Bronson, Ph.D.[5], Genmin Lu, Ph.D.[5], Pamela B. Conley, Ph.D.[5], Peter Verhamme, MD, Ph.D.[6], Jeannot Schmidt, MD[7], Saskia Middeldorp, MD[8], Alexander T. Cohen, MD, FRACP[9], Jan Beyer-Westendorf, MD[10], Pierre Albaladejo, MD[11], Jose Lopez-Sendon, MD[12], Shelly Goodman, Ph.D.[5], *Janet M. Leeds, Ph.D.*[5], Deborah M. Siegal, MD[1], Elena Zotova, Ph.D.[1], Brandi Meeks, B.Eng[1], Juliet Nakamya, Ph.D.[1], John T. Curnutte, MD, Ph.D.[5], W Richey Neuman, MD, MPH[5]; [1]McMaster

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**203. Apixaban pharmacodynamics in octogenarian patients with NOV-valvular atrial fibrillation** *Ran Nissan, Pharm.D.*[1], Galia Spectre, MD[1], Avital Hershkovitz, MD[2], Hefziba Green, MD[1], Shai Shimoni, MD[1], Sigal Nakav, Ph.D.[1], Tzipora Shohat, Msc[1], Alon Grossman, MD[1], Shmuel Fuchs, MD[3]; [1]Beilinson Hospital, Rabin Medical Center, Petah Tikva, Israel [2]Beit Rivka Geriatric Rehabilitation Center, Petah Tikva, Israel [3]Assaf Harofe Medical Center, Zrifin, Israel

**INTRODUCTION:** There is paucity of data on apixaban levels among octogenarians with non-valvular atrial fibrillation (NVAF).

**RESEARCH QUESTION OR HYPOTHESIS:** We hypothesized that octogenarians may have higher drug levels of apixaban than specified by the manufacturer. We therefore sought to assess apixaban trough and peak drug levels among "real world" octogenarians who received various apixaban dosages for NVAF, and compared this data to levels found in patients younger than 70-year old.

**STUDY DESIGN:** A cross sectional, prospective study of 80 patients treated with apixaban for NVAF.

**METHODS:** Apixaban levels were compared among octogenarians treated with 5 mg (bid: twice daily), octogenarians with appropriately reduced dose (2.5 mg bid), octogenarians with inappropriately reduced dose and younger patients (age < 70 years). Trough and peak levels were measured by a chromogenic assay calibrated for apixaban after at least 4 days of complete adherence.

**RESULTS:** A significant proportion of the cohort had supra-therapeutic trough [n=11 (13.7%)] and peak [n=16 (20%)] levels, especially octogenarians with 5mg bid dose [n=6 (30%) for trough and n=8 (40%) for peak]. No significant differences were found in the trough or peak geometric mean (GM) levels among the groups, apart from the peak GM levels between the 5 mg octogenarian group and the other two 2.5 mg bid octogenarian groups (p=0.0004). The frequency of apixaban peak levels within the upper quartile was significantly higher in the 5 mg octogenarian group compared to the other groups [n=12 (60%) of measurements, p=0.019), whereas trough levels were comparable between groups.

**CONCLUSION:** High and supra-therapeutic peak apixaban steady state levels are highly prevalent in octogenarians receiving appropriate dosage of 5 mg bid for NVAF stroke prevention. Age above 80 strongly affects apixaban levels.

**204. Evaluation of the safety of intravenous ketorolac in patients admitted for sickle cell disease vaso-occlusive crisis** *Rachel Crawford, Pharm.D.*[1], Giulia Barlow, Pharm.D.[2], Allison Kupsh, Pharm.D.[3], Katherine Rector, Pharm.D., BCPS[1], Jamielynn Sebaaly, Pharm.D.[4], Justin Arnall, Pharm.D.. BCOP[5], Padmaja Veeramreddy, MD[6], Ifeyinwa Osunkwo, MD, MPH[7]; [1]Department of Pharmacy, Carolinas Medical Center, Charlotte, NC [2]Department of Pharmacy, Carolinas Medical Center, charlotte, NC [3]UNC Eshelman School of Pharmacy, Carolinas Medical Center, Charlotte, NC [4]Wingate University School of Pharmacy, Wingate, NC [5]Levine Cancer Institute, Pharmacy department, Carolinas Healthcare system, Charlotte, NC [6]Sickle Cell Clinic, Levine Cancer Institute, Charlotte, NC [7]Levine Cancer Institute, Charlotte, NC

**INTRODUCTION:** The treatment of sickle cell disease (SCD) vaso-occlusive crises (VOC) is complex and poorly defined due to the multifactorial pathophysiology of SCD pain. The SCD treatment team at Carolinas Medical Center utilizes IV ketorolac as an adjunct to opioids in a subset of patients. To our knowledge, no published data examines the safety of IV ketorolac in adult SCD patients admitted for the treatment of VOC.

**RESEARCH QUESTION OR HYPOTHESIS:** Is IV ketorolac safe to use in adults admitted for VOC as measured by the incidence of AKI?

**STUDY DESIGN:** Single center, retrospective chart review

**METHODS:** SCD patients admitted for VOC from July 2015-July 2017 were identified and categorized into three groups based upon receipt of scheduled IV ketorolac or ≥ 50% of their as needed (PRN) doses; scheduled oral NSAIDs or ≥ 50% of their PRN doses; a control group of patients that did not receive NSAIDs or received < 50% of their PRN NSAID doses. Secondary objectives included incidence of bleeding and length of stay.

**RESULTS:** A total of 151 patients were included in the study. No difference was detected in the incidence of AKI between study groups. The patients in the scheduled IV ketorolac group had better baseline renal function as compared to the other 2 groups. No difference in bleeding events, length of stay, or concurrent use of medications that increase the risk of bleeding was detected. Patients who did not receive scheduled oral NSAIDs or < 50% of their PRN doses were more likely to have received nephrotoxic medications. No additional differences were found.

**CONCLUSION:** The use of IV ketorolac did not appear to increase the incidence of AKI in patients with SCD VOC with adequate renal function. A larger, prospective, matched subject study would be needed to further elucidate the safety of IV ketorolac in SCD patients.

**205. Clinical consequences related to discrepancies between laboratory and point of care INRs** *Gregory Roberts, B Pharm*[1], Madison Shepley, B Pharm[2], Dominic Parker, MD[3], Jessica Dawson, B Pharm[1], Barbara Farrelly, B Nurs[4]; [1]SA Pharmacy, Flinders Medical Centre, Bedford Park, Australia [2]SA Pharmacy, Bedford Park, Australia [3]Department of Medicine, Flinders Medical Centre, Bedford Park, Australia [4]Hospital at Home, Flinders Medical Centre, Bedford Park, Australia

**INTRODUCTION:** Laboratory-based (LAB) testing for International Normalised Ratio (INR) is 'gold standard' but Point of Care (POC) INR facilitates extended hospital care after discharge. A marked discordance between LAB and POC INR was anecdotally noted after changing the laboratory assay, disrupting clinical management, especially in patients receiving mechanical heart valves. The same POC system was used across the entire study period.

**RESEARCH QUESTION OR HYPOTHESIS:** Compare concurrent LAB/POC INRs for patients transitioning to extended hospital care, both pre (PRE) and post (POST) implementation of the new laboratory assay.

**STUDY DESIGN:** Retrospective INR measurements with concurrent POC and LAB INRs were identified.

**METHODS:** POC/LAB differences for INR pairs were compared across the PRE and POST periods using multivariable regression analysis. Variables included patient type (general surgery (GenSurg), cardiac surgery (Cardsurg), medical (Med)), heart failure, liver function, albumin, days post-commencement. Concordance to standards was assessed using international guidelines.

**RESULTS:** POC/LAB INR differences increased markedly in the POST period (PRE -3±17% (n=67), POST 66±35% (n=74), p<0.001). For Cardsurg this was -3±13 and 82±30 (p<0.001), for Gensurg 2±18 and 36±38 (p<0.001), and 9±18 and 39±23 (p<0.001) for the Med group. The increase for CardSurg patients was greater than Gensurg or Med (p<0.01 for both). No other variables impacted the POC/LAB relationship. In the PRE group, 99% of INR pairs were within the allowable 30% maximum INR difference for INR range 2.0-4.5, compared with 59% of the POST group (p<0.001). Using local guidelines, use of POC instead of LAB INR would have resulted in an extra 2.4% of doses held in the PRE period due to INR>4.5, compared with 16.7% in the POST period (p<0.001).

**CONCLUSION:** The change in LAB assay markedly impacted POC/LAB INR relationship, with clear clinical disruption. In light of this evidence state-wide guidelines have now been altered to accommodate this discrepancy.

**206. Analysis of direct oral anticoagulant prescribing at an academic medical center** *Julie A. Murphy, Pharm.D., FASHP, FCCP, BCPS*[1], Rebecca Wong, Pharm.D.[2], Rachel E. Rarus, Pharm.D., BCPS[2]; [1]College of Pharmacy and Pharmaceutical Sciences, University of Toledo, Toledo, OH [2]University of Toledo Medical Center, Toledo, OH

**INTRODUCTION:** Studies suggest that the implementation of a pharmacy-assisted direct oral anticoagulant (DOAC) protocol helps increase the appropriateness of DOAC prescribing. However, these studies do not address protocols that include anticoagulant transitions to or from DOACs, or ensure adequate sample size.

**RESEARCH QUESTION OR HYPOTHESIS:** Does the implementation of a pharmacy-assisted anticoagulation transition policy increase the prevalence of appropriate DOAC prescribing?

**STUDY DESIGN:** Single-center, retrospective, quasi-experimental study.

**METHODS:** Adult patients admitted to a non-intensive care unit who received at least one dose of apixaban, rivaroxaban, or dabigatran from February 1, 2014-January 31, 2015 (pre-implementation) or February 1, 2015-January 31, 2016 (post-implementation) were eligible for inclusion. The primary outcome was the prevalence of appropriate DOAC prescribing before and after implementation of a pharmacy-assisted anticoagulation transition policy. Secondary objectives included to: 1) identify patient-specific factors (age, renal function, and DOAC prescribed) potentially contributing to inappropriate DOAC prescribing, and 2) determine adverse events associated with inappropriate DOAC prescribing. To meet power, 290 total subjects were needed. Outcomes were statistically significant when p-value <0.05.

**RESULTS:** One hundred forty-five patients were identified for inclusion in the pre-implementation group and 146 in the post-implementation group. A total of 46.9% and 58.2% of patients received an appropriately prescribed DOAC in the pre- and post-implementation groups, respectively (p=0.053). Patients in the post-implementation group were younger (median age = 64 vs. 71 years; p=0.006), had a higher estimated creatinine clearance (median = 70 vs. 64 mL/min; p=0.030), and were prescribed apixaban more commonly than other DOACs (p<0.001). There was no difference for DOAC indication (p=0.960); atrial fibrillation was the most common indication in both groups. Inappropriate DOAC prescribing did not result in any adverse events.

**CONCLUSION:** The implementation of a pharmacy-assisted anticoagulation transition policy did not significantly affect overall appropriateness of DOAC prescribing.

**207. Anticoagulation quality in pharmacist-lead anticoagulation clinic in rural setting compared with standard care** *Bryan Zobeck, Pharm.D.*[1], Martin MacDowell, DrPH[2], Sing Ping Chow, BS[3]; [1]Department of Pharmacy Practice, University of Illinois College of Pharmacy at Rockford, Rockford, IL [2]National Center for Rural Health Professions, University of Illinois College of Pharmacy at Rockford, Rockford, IL [3]University of Illinois at Chicago, Rockford, IL

**INTRODUCTION:** Pharmacist-managed anticoagulation clinics have been described since 1985, and improve International Normalized Ratio (INR) time in therapeutic range (TTR), reduce thromboembolic and bleeding events, and reduce cost. While this model is well described in major medical centers, it is rarely described in rural populations who face unique health disparities.

**RESEARCH QUESTION OR HYPOTHESIS:** Does a pharmacist-managed anticoagulation clinic improve quality measures of anticoagulation care, TTR and INR adherence, in a rural population?

**STUDY DESIGN:** Single-center retrospective cohort with each patient serving as his/her own historical control pre- and post- anticoagulation clinic enrollment.

**METHODS:** All patients enrolled in the Anticoagulation Clinic for 15 months after its initiation in May 2016 were evaluated. Inclusion criteria included age > 18 and at least 3 months of warfarin before and after enrollment in the clinic. INR values within 14 days after (a) held

dose(s) were excluded from analysis. The primary endpoint was INR TTR (using Rosendaal method). Secondary endpoints included percentage of INR measurements in range, INR results above 4.9, TTR and INRs in range using a relaxed (+/- 0.2) INR goal, days INR appointment was missed by, and number of INRs missed by over 7 days. SPSS 24 (Chicago: IBM Corporation) was used for analysis.

**RESULTS:** Ninety-two (92) patients met inclusion criteria and were included for analysis. The Anticoagulation Clinic increased INR TTR (69% vs. 55%, p=0.03) and the percentage of INRs in goal range (63% vs. 51%, p=0.006) compared with usual care. The number of days INR were missed by was reduced (1 vs. 13 days, p<0.001) and the percentage of INRs missed by over 7 days (3.7% vs. 27%, p<0.001) compared to usual care. Percentage of INRs above 4.9 was not significantly different.

**CONCLUSION:** The establishment of a pharmacist-managed anticoagulation clinic significantly improved INR control and INR monitoring adherence.

**208. Appropriateness of thrombophilia testing in patients in the acute care setting and an evaluation of the associated costs** *Riddhi Virparia, Pharm.D. Candidate*[1], Luigi Brunetti, Pharm.D., MPH, BCPS, BCGP[2], Christopher Adams, Pharm.D., BCPS, BCCCP[2]; [1]Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ [2]Department of Pharmacy Practice and Administration, Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ

**INTRODUCTION:** Thrombophilia testing is rarely recommended in acute care settings due to the high likelihood of false-positive and false-negative results. Inappropriately performing these tests in the acute care setting is associated with inaccurate interpretation and an increased economic burden. In this retrospective analysis, the appropriateness of thrombophilia tests ordered for patients in an acute care setting was evaluated in terms of both clinical utility and economic costs.

**RESEARCH QUESTION OR HYPOTHESIS:** Are thrombophilia tests being ordered appropriately in an acute care setting?

**STUDY DESIGN:** Retrospective analysis of all consecutive adult inpatients discharged from an academic community medical center from November 1, 2016 to November 1, 2017 who received thrombophilia testing.

**METHODS:** Patients were stratified into two groups: appropriately tested and inappropriately tested based on data abstracted directly from the electronic health record. The primary outcome, the appropriateness of the tests, was based on published criteria for thrombophilia testing and included concurrent anticoagulation use, patient admitting diagnosis, and/or comorbidities associated with thrombosis risk. The secondary endpoint was the financial burden of inappropriate thrombophilia testing based on assay charges.

**RESULTS:** The analytic sample included 200 patients and 1,393 thrombophilia tests. In 179 patients (89.5%), 1,168 tests (83.8%) were inappropriately conducted. From 179 patients, tests in 85 were inappropriate due to concurrent anticoagulant use and/or provoked venous thromboembolism (VTE), and tests in 94 were inappropriate due to a lack of 2 or more risk factors for thrombophilia. Only 21 patients (10.5%) had appropriate testing with 225 tests (16.2%). The financial impact of inappropriate testing was estimated as excess charges amounting to $148,151.16/year.

**CONCLUSION:** Thrombophilia testing in this acute care setting was often inappropriate and did not consider patient characteristics, which may influence interpretation. Restricting use to avoid these unnecessary risks and costs warrants further analysis.

**209. Implementation of an institutional fixed-dose PCC protocol: assessing simplification and cost savings** *Cora Housley, Pharm.D.*[1], Scott Mueller, Pharm.D.[1], Tyree Kiser, Pharm.D.[1], Edward T. Van Matre, Pharm.D., MS[2], Robert MacLaren, Pharm.D., MPH[1], Douglas N. Fish, Pharm.D.[1], Paul Reynolds, Pharm.D.[1], Toby C. Trujillo, Pharm. D., BCPS (AQ Cardiology)[1]; [1]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO [2]University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

**INTRODUCTION:** Labelled dosages for four-factor prothrombin complex concentrate (PCC) for urgent reversal of anticoagulation with warfarin are based on weight and INR. Previous studies using a fixed-dose protocol demonstrate promising clinical and economic results.

**RESEARCH QUESTION OR HYPOTHESIS:** The aim of this study was to evaluate the impact of a fixed-dose PCC protocol on cost, time to administration and pharmacist workload.

**STUDY DESIGN:** We conducted a retrospective review of patients who received PCC at the University of Colorado Hospital (UCH) before (August 2013 – August 2015) and after (July 2017 – November 2017) implementing fixed dosing.

**METHODS:** All adult patients who received PCC at UCH were eligible for inclusion except those who received PCC for organ transplantation. The primary outcome was cost of PCC per patient post vs. pre-protocol. Secondary outcomes included time to administration, number of PCC orders modified by a pharmacist, and protocol adherence.

**RESULTS:** Baseline characteristics and clinical outcomes were similar between the 85 patients who received PCC post-protocol compared to the 80 pre-protocol. Patients in the post-protocol group received less initial, total, and weight-adjusted total median PCC doses compared to the pre-protocol group (1500 vs 2264 units, 2000 vs 2500 units, 23.4 vs 27.3 units/kg, respectively; P value <0.001 for all) which relates to a $1385-$2116 savings per patient based on AWP. The protocol resulted in shorter time from initial order to verification (7 minutes difference) and fewer interventions by the pharmacist for dose modifications (25.9% vs 66.2%, p<0.001). However, time from order to administration was similar between the two groups (45 vs 52.5 minutes, p=0.29). Protocol adherence was 47.1%. Post-protocol patients receiving off protocol doses received a median excess of 500 units.

**CONCLUSION:** A fixed-dose PCC protocol resulted in reduced costs and pharmacist workload. Additional education will improve protocol adherence to further reduce costs.

## HERBAL/COMPLEMENTARY MEDICINE

**210. Melatonin use in an academic medical center: factors impacting provider documentation of patients' sleep quality** *Susan Smith, BS, Pharm.D.*[1], P. Brittany Vickery, Pharm.D.[2], Samir Kouzi, Ph. D.[1], Kishan Patel, Pharm.D.[1]; [1]Wingate University School of Pharmacy, Wingate, NC [2]Wingate University School of Pharmacy, Hendersonville, NC

**INTRODUCTION:** Melatonin is prescribed for insomnia, jet lag, and circadian rhythm sleep-wake disorder. It appears to be perceived as a more benign sleep aid relative to other pharmacological agents. However, the 2017 American Academy of Sleep Medicine guideline recommends against melatonin as a treatment for insomnia in adults due to lack of evidence for efficacy and the unavailability of systematic data on side effects.

**RESEARCH QUESTION OR HYPOTHESIS:** Study objectives included to: 1) determine what percentage of prescribers document the impact of melatonin on sleep quality in hospitalized patients, and 2) examine factors that may impact provider documentation.

**STUDY DESIGN:** Single-center, retrospective review

**METHODS:** Electronic medical records of 200 adults with orders for melatonin over a 6-month period were reviewed. The primary outcome was to evaluate provider documentation of sleep and the impact of melatonin on patients' reported sleep quality. Secondary outcomes included an evaluation of provider medication reconciliation (admission/discharge) and concomitant insomnia therapy. Descriptive and inferential statistics were performed (V13.1 Systat Software, Inc.). P-values < 0.05 denoted significance.

**RESULTS:** Providers documented sleep quality for 65 (32.5%) patients (15.47 ± 29.23, range 5 to 100%). Specific mention of melatonin's impact on sleep quality was available for 16 (8%) patients. Fifty-four (27%) patients received melatonin prior to admission, and 73 (36.5%) continued therapy at discharge. Patients discharged on melatonin had greater sleep quality documentation compared to those discharged without melatonin (41.1% vs. 27.6%, p<0.05). Fifty-nine (29.5%) patients had concomitant insomnia medications. Provider documentation was greater for patients receiving combination therapy (44.1%) compared to melatonin monotherapy (27.7%), (p<0.05).

**CONCLUSION:** Documentation of patients' reported sleep quality was lacking for 67.5% of patients. Melatonin was continued upon discharge for an additional 9.5% of study patients. Patients receiving melatonin plus additional insomnia medications had an increase in sleep quality documentation. This study demonstrated that melatonin is widely used but narrowly monitored.

## HIV/AIDS

**211E. A phase 3b, open-label, pilot study to evaluate switching to elvitegravir/cobicistat/emtricitabine/tenofovir alafenamide (E/C/F/TAF) in virologically-suppressed HIV-1 infected adult subjects harboring the NRTI resistance mutation M184V/I (GS-US-292-1824)** Ignacio Perez-Valero, MD[1], Josep Llibre, MD[2], Adriano Lazzarin, MD[3], Giovanni Di Perri, MD[4], Federico Pulido, MD[5], Jean-Michel Molina, MD[6], Stefan Esser, MD[7], *Ian McNicholl, Pharm.D.*[8], Rene-Pierre Lorgeoux, Ph.D.[9], Nicolas A. Margot, BS, MA[10], Yongwu Shao, Ph.D.[11], David Piontkowsky, JD, MD[11], Moupali Das, MD[11], Richard Haubrich, MD[8]; [1]Unidad VIH – Hospital Universitario La Paz, Madrid, Spain [2]Fundación Lucha contra el SIDA, Barcelona, Spain [3]Fondazione IRCCS San Raffaele del Monte Tabor, Milan, Italy [4]Dipartimento di Malattie Infettive e Tropicali, Turin, Italy [5]Unidad VIH, Hospital Universitario 12 de Octubre, imas12, UCM, Madrid, Spain [6]Department of Infectious Diseases, Saint-Louis Hospital and University of Paris, Paris, France [7]Universitatsklinikum Essen, Essen, Germany [8]HIV Medical Affairs, Gilead Sciences, Foster City, CA [9]Gilead Sciences, Montreal, QC, Canada [10]Clinical Virology, Gilead Sciences, Inc., Foster City, CA [11]Gilead Sciences, Foster City, CA

Presented orally at AIDS 2018 in Amsterdam on July 24, 2018.

**212. Are HIV-related diagnostics excessively ordered? a pilot intervention study to optimize testing in the acute care setting** Daryush Tabatabai Asl, Pharm.D.[1], *Harminder Sikand, Pharm.D., F.C.S.H.P., .F.A.S.H.P., F.C.C.P.*[1], Eva Sullivan, Pharm.D.[1], Nancy Crum-Cianflone, MD, M.P.H.[2]; [1]Department of Pharmacy, Scripps Mercy Hospital, San Diego, CA [2]Infectious Disease, Scripps Health, San Diego, CA

**INTRODUCTION:** Unnecessary ordering of HIV-related laboratory tests (CD4 counts, HIV RNA levels, and HIV genotypes) can result in increased healthcare costs, unneeded interventions, patient anxiety and discomfort. Recent data have evaluated methods to reduce excessive testing in outpatients, but there are limited data in the inpatient setting.

**RESEARCH QUESTION OR HYPOTHESIS:** Does implementation of a guideline-based pharmacist-driven intervention protocol improve utilization of HIV-related diagnostics and allocation of antimicrobial stewardship resources in the acute care setting.

**STUDY DESIGN:** Two phase study in a large academic medical center. Pre-intervention arm evaluated HIV diagnostics usage over a 1-year period, followed by a 4-month post-interventional arm analysis.

**METHODS:** Patients were included if ≥18 years old with suspected or documented HIV infection and CD4 count, HIV RNA level, or HIV genotype ordered. A pharmacist-driven intervention algorithm for each test was created based on CDC and DHHS guidelines and approved by the Pharmacy and Therapeutics committee allowing the primary investigator automatic authority to cancel testing if deemed inappropriate. Clinicians were provided education on appropriate ordering prior to study initiation. Results were tabulated and presented as descriptive statistics, and financial data was calculated based on in-hospital costs.

**RESULTS:** Pre-intervention arm, 87% (296/341) of tests ordered did not meet criteria for appropriateness resulting in financial burden of $24,600. Post-intervention, 63% (39/62) of tests ordered were intervened upon and cancelled resulting in a cost avoidance of $3,216 in 4 months and $25,912 annualized. Common cancellation reason was availability of recent outpatient labs. Post-intervention, HIV-related testing decreased over time attributed to the intervention audit and feedback providers.

**CONCLUSION:** Pharmacist-driven intervention reduced the number of unnecessary HIV-associated tests by 63% with concomitant cost savings. This study highlights the importance of evaluating appropriateness of HIV-related diagnostic testing in the acute care setting.

**213. Assessment of single tablet antiretroviral therapy adherence in relation to pharmacy selection among individuals infected with HIV-1** *Merrion Buckley, Pharm.D./MPH Candidate*[1], Drew Armstrong, Pharm.D., BCACP, AAHIVP[2], Crystal Walker, Ph.D., DNP, FNP-C[3]; [1]College of Pharmacy, University of Tennessee Health Science Center, Memphis, TN [2]Adult Special Care Clinic, Regional One Health, Memphis, TN [3]College of Nursing, University of Tennessee Health Science Center, Memphis, TN

**INTRODUCTION:** Combination antiretroviral therapy (ART) is the mainstay treatment for individuals infected with human immunodeficiency virus (HIV)-1. Adherence to ART is critical in these patients, contributing to viral suppression and positive health outcomes.

**RESEARCH QUESTION OR HYPOTHESIS:** Does pharmacy selection impact adherence of single tablet ART and viral suppression among persons infected with HIV?

**STUDY DESIGN:** Single center, retrospective review.

**METHODS:** All single tablet antiretroviral prescriptions prescribed from the Adult Special Care Clinic during 2017 were collected using the electronic health record. Single tablet antiretroviral prescriptions sent to Regional One Health Specialty Pharmacy (ROH; Memphis, TN) and Nashville Pharmacy Service (NPS; Nashville, TN) were analyzed; 50 from each group were randomized and retrospectively evaluated for refill dates and patient pick-up (ROH) or mail-out dates (NPS) over a 6-month period. Patients were excluded if they did not receive at least one 30-day supply of ART during the 6-month interval. Patient demographics, CD4, and HIV viral load were collected. Patients were considered adherent if the proportion of days with a prescription over the 6-month interval was above 90%.

**RESULTS:** A total of 50 patients from ROH and 48 patients from NPS were included and evaluated for adherence. Of the 98 patients evaluated, 29.8% were considered to be adherent. Of these, more individuals from ROH (67.7%) were adherent to their medications compared to patients utilizing NPS (32.1%) (p=0.027). Viral suppression (HIV RNA <200 copies/mL) was observed in 80.6% of adherent patients and 54.5% of non-adherent patients (p=0.024).

**CONCLUSION:** Individuals infected with HIV-1 utilizing ROH were more likely to be adherent to ART than those who received medications via NPS. Patients who were adherent were also more likely to be virally suppressed. These results provide evidence of recommendation for patient selection of a Specialty Pharmacy, such as ROH, for ART medications.

**214. Real-world evaluation of the safety and tolerability of abacavir/dolutegravir/lamivudine in an incarcerated population** *Marisa Brizzi, Pharm.D.*, Melissa Badowski, Pharm.D., MPH, Thomas Chiampas, Pharm.D.; Department of Pharmacy Practice, University of Illinois at Chicago College of Pharmacy, Chicago, IL

**INTRODUCTION:** It seems as though major clinical trials overestimate the safety and tolerability of dolutegravir-based antiretroviral therapy (ART). There has been a trend of increasing side effects and laboratory abnormalities in patients treated at the University of Illinois (UIH) HIV telemedicine clinic after switching from previous antiretroviral therapy (ART) to abacavir/dolutegravir/lamivudine (ABC/3TC/DTG).

**RESEARCH QUESTION OR HYPOTHESIS:** There is a higher incidence of side effects and laboratory abnormalities in real-world HIV-infected patients compared to major clinical trials.

**STUDY DESIGN:** This study was a single-center, retrospective, pre- and post- analysis of incarcerated patients receiving care at an HIV telemedicine clinic at UIH between January 1, 2015 and June 30, 2017.

**METHODS:** Adult patients switched from previous ART to ABC/3TC/DTG were included in the study. Primary endpoints included incidence of patient reported side effects and change in SCr, AST, and ALT from baseline. Secondary endpoint was evaluation of virologic suppression at baseline and after switch. Data was collected at baseline and follow-up visits. Descriptive statistics were used for baseline characteristics and incidence of primary and secondary outcomes. Wilcoxon rank-sum test was used to evaluate change in SCr and McNemar test was used to evaluate virologic suppression. All analyses were conducted in GraphPad Prism (version 7).

**RESULTS:** After switching from previous ART to ABC/3TC/DTG, 20% (N=95) of patients reported side effects, with most common including headache (7.4%), nausea (6.3%), rash (3.2%), fatigue (3.2%) and insomnia (2.1%). There were statistically significant increases in SCr in 20% of the patients (P<0.0001), with a median increase of 0.38 mg/dL. At the final follow-up visit, the proportion of patients with virologic suppression was similar before and after switching to abacavir/dolutegravir/lamivudine (87% vs. 86%).

**CONCLUSION:** ABC/3TC/DTG appears to have similar or less side effects in the real-world incarcerated population compared to clinical trials. Dolutegravir-based antiretroviral therapy can cause statistically significant increases in SCr in some patients.

**215. Integrating pharmacists into the treatment management team for patients living with human immunodeficiency virus and hepatitis c virus** Bernadette Jakeman, Pharm.D.[1], Thien-An Vu, Pharm.D. Candidate[1], *Paulina Deming, Pharm.D.*[1], Larry Pineda, Pharm.D.[2], Letitia Tomaszewski, BS, MD Candidate[1], Sarah Perez, Pharm.D.[1], Karla Thornton, MD, MPH[3]; [1]College of Pharmacy, Department of Pharmacy Practice & Administrative Sciences, University of New Mexico Health Sciences Center, Albuquerque, NM [2]Department of Quality Management, Covenant Health System, Lubbock, TX [3]School of Medicine, Department of Internal Medicine, University of New Mexico Health Sciences Center, Albuquerque, NM

**INTRODUCTION:** Hepatitis C virus (HCV) coinfection rates amongst persons living with HIV (PLWH) are as high as 25%. HCV treatment with direct-acting antiviral (DAAs) in PLWH can be complicated by

drug interactions, adherence, insurance restrictions, and limited HCV providers. To address these issues Truman Health Services (THS) HCV clinic established a physician/pharmacist clinician (PhC) collaborative practice model. Initial clinic visits are conducted by the team and follow-up visits are conducted by the PhC.

**RESEARCH QUESTION OR HYPOTHESIS:** Will utilizing a PhC for HCV treatment management in HIV/HCV co-infected patients result in high rates (>95%) of sustained virologic response (SVR)?

**STUDY DESIGN:** This was a retrospective observational study of PLWH seen at THS HCV clinic between 01/01/2015–12/08/2017.

**METHODS:** A chart review was completed. Patients were excluded if they had not started HCV treatment or were monoinfected with HCV. Data collected included demographics, comorbidities, HCV genotype and viral load, prior HCV treatment, HIV regimen and changes, HIV viral load, CD4 count, and number of clinic visits.

**RESULTS:** A total of 94 charts were reviewed and 42 excluded (29 monoinfections, 13 no treatment). Of the 52 patients included for analysis, the average age was 50.1 years, 88.5% were male, 63.5% were white. The most common genotype was 1a (34.6%). A total of 30.8% of patients had cirrhosis and 11.5% were HCV treatment-experienced. At start of HCV treatment 63.5% of patients had an undetectable HIV viral load. HIV regimen change was required in 19.2% of patients. The average number of follow-up PhC visits was 3.3. At 12-weeks post treatment, 6 patients were lost to follow-up. Of the remaining 46 patients, 100% achieved SVR.

**CONCLUSION:** HIV/HCV coinfected patients achieved high rates of SVR. Pharmacists can be successfully integrated into the HIV/HCV management team allowing for a larger number of patients to receive HCV treatment.

## INFECTIOUS DISEASES

**216. Evaluation of alternative dosing regimen of intravenous voriconazole for the treatment of invasive aspergillosis in pediatric immunocompromised patients: therapeutic drug monitoring and safety**

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**INTRODUCTION:** The high pharmacokinetic variability of voriconazole (VCZ) and the importance of achieving adequate plasma concentrations (PC) in pediatric immunocompromised with invasive Aspergillosis (IA), has led to the need to evaluate the current dosage regimens and generate new recommendations.

**RESEARCH QUESTION OR HYPOTHESIS:** Regimen of three times a day (TID) is associated with better CPs than conventional regimens (BID).

**STUDY DESIGN:** Retrospective study in a single center of a cohort of pediatric immunocompromised patients with suspected AI treated with VCZ.

**METHODS:** Patients who received VCZ between 2015-2017 were included. Trough PC obtained from the Syslab system, were compared according to dosage regimen TID/BID and age range (<2, 2-12, > 12 years), considering optimal CPs ≥1mg/L. The safety was assessed.

**RESULTS:** 59 patients were included with 136 PCs, 73 (54%) with TID regimen and 63 (46%) BID. In TID, 58% of the PCs were ≥ 1mg/L while in BID 49% of the PCs were ≥ 1mg/L with a median CP and dose of 1.47mg/L (0.15-7.71) and 15 mg/kg/day (7-27) in TID and 0.96 mg/L (0.1-5.46) and 14,6 mg/kg/day (4,8-25,9) in BID. Children younger than 2 years old, 100% (2/2) of the PCs were ≥ 1mg/L in TID v/s 12.5% (1/7) in BID. Children between 2-12 years old, 73.2% (41/56) of the PCs were ≥ 1mg/L in TID v/s 51% (22/43) in BID. Children older than 12 years 47% (7/15) of the PCs were ≥ 1mg/L in TID v/s 67% (8/12) in BID. Hepatic and renal toxicity were not detected. Visual alterations occurred in 3 patients in TID and 4 patients in BID.

**CONCLUSION:** The data obtained suggest that TID regimens are associated with a higher percentage of adequate CPs in children under 12 years old compared to conventional regimens. On the other hand, children older than 12 years achieve better CPs with conventional regimens. Both regimes were safe.

**217. Infectious pharmacists participate in a diagnostic stewardship for invasive aspergillus infection diseases: a retrospective observational study**

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**INTRODUCTION:** Diagnostic stewardship refers to the appropriate use of laboratory testing to guide patient management, including treatment. Infectious pharmacists involved in the diagnostic stewardship based on bedside MDT will shorten the time from diagnosis to treatment and optimize antifungal treatment.

**RESEARCH QUESTION OR HYPOTHESIS:** Pharmacists participating in diagnostic stewardship can shorten diagnosis-treatment time and optimize antifungal treatment.

**STUDY DESIGN:** Retrospective observational studies were used to clarify the importance of infectious pharmacists in the diagnostic stewardship model.

**METHODS:** From July 2016 to July 2017, 13 patients with diagnosis invasive aspergillus infections in respiratory medicine ward, a tertiary hospital in China, were observed retrospectively to perform multidisciplinary team diagnostic stewardship in which pharmacists participated. Invasive aspergillus infection patients who were treated with non-diagnosis stewardship between July 2016 to July 2017 as a control group (n=11), and the differences in diagnosis time, diagnosis-treatment time and dosage adjustment were compared between the two groups.

**RESULTS:** The diagnostic time of the DS group (0.8562 ± 0.2737, n=13) was significantly shorter than the non-DS group (26.09 ± 3.918, n=11) (*P < 0.0001*). In the DS group, due to the participation of pharmacists, the pharmacist formulated an antifungal treatment plan at the bedside according to the actual situation of the patient when the microbiology results were clear. The time from diagnosis to treatment of the DS group (69.69 ± 7.044, n=13) was significantly shorter than that of the non-DS group (130.2 ± 18.51, n=11) (*P = 0.0037*). The pharmacist adjusted the drug dose (voriconazole) in 9 patients in the DS group. Only one patient in the non-DS group requested a pharmacist consultation to adjust the dose. (*P= 0.0045*)

**CONCLUSION:** Infectious pharmacists involved in diagnostic stewardship can optimize antifungal treatment, shorten the time of diagnosis and diagnosis-treatment time, and save time for the treatment of patients with invasive aspergillosis.

**218. The first-year experience with the procalcitonin assay in a rural facility: a high-cost, low-efficacy intervention** *Jennifer Cole, Pharm.D., BCPS, BCCCP*; Department of Pharmacy, Veterans Health Care System of the Ozarks, Fayetteville, AR

**INTRODUCTION:** Procalcitonin (PCT) has gained utility in antimicrobial stewardship programs as a tool to decrease antibiotic exposure. There is a paucity of real-world outcomes with this intervention, specifically in smaller hospitals. Some experts hypothesize that PCT may lead to a high-cost, low-efficacy intervention. The implementation of the PCT assay at the study facility has been previously reported in detail, including education, monitoring, solicitation of feedback, and interim results. This study describes the impact of the PCT assay after 12 months of utilization.

**RESEARCH QUESTION OR HYPOTHESIS:** Can the benefits of procalcitonin seen in randomized controlled trials in tertiary medical centers be reproduced in a 65-bed primary hospital under non-study conditions?

**STUDY DESIGN:** This was a quasi-experimental before and after study design evaluating two 12-month periods: May 2016 – April 2017 (before) versus May 2017 – April 2018 (after).

**METHODS:** Antibiotic consumption was measured with days of therapy (DOT) per 1000 patient days (PD). Length of stay (LOS), admission rates, and antimicrobial purchasing costs between the 2 periods were also compared. Observational data included the number of assays ordered and the cost of procurement. A chi square of proportions was used to compare DOT/1000PD while a student's t test was used for continuous variables. All statistics were evaluated in R Foundation for Statistical Computing version 3.4.3 (Vienna, Austria).

**RESULTS:** Antibiotic consumption was only marginally decreased by the intervention: 76.5% before, 72.5% after (P<.0001). There was no change in average LOS (3.6 days before, 3.7 days after, p=0.75) or admission rates (17.8% before, 17.2% after, p=0.16). There was no cost savings in antibiotic purchasing: $306,173 before versus $315,303 after (difference +$9,103), while PCT procurement reached $63,274.

**CONCLUSION:** Implementation of the PCT assay in a 65-bed facility demonstrated a marginal decrease in antibiotic consumption while having no effect on LOS, admission rates, or purchasing costs.

**219E. Implementation of a vancomycin AUC monitoring program: peaks and pitfalls** *Zahra Kassamali, Pharm.D.*[1], Thu Nguyen, Pharm. D.[2]; [1]School of Pharmacy, University of Washington, Seattle, WA [2]UW Medicine, Valley Medical Center, Renton, WA

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**220. Clostridium difficile time out: a nurse-driven protocol to optimize testing stewardship** Nikunj Vyas, Pharm.D., BCPS[1], *Shereef Ali, Pharm.D., BCPS, BCCCP*[2], Cindy Hou, DO, MBA[3], Lea Ann Kellum, MSN, RN, CCRN, CEN[2], Mary Miller, RN, BSN, CIC[2], Ann Marie Flory, MSN, RN, NE-BC[2]; [1]Jefferson Health of New Jersey, Stratford, NJ [2]Jefferson Health of New Jersey, Cherry Hill, NJ [3]Kennedy Health Alliance, Infectious Diseases, Voorhees, NJ

**INTRODUCTION:** There remains a challenge in distinguishing colonization versus infection with *Clostridium difficile* (*C. diff*) associated diarrhea. At our institution, despite effective antimicrobial stewardship efforts, *C. diff* tests and positive infections remained high identifying a need for C. diff testing stewardship optimization

**RESEARCH QUESTION OR HYPOTHESIS:** Does *C.diff* testing stewardship optimization decrease *C. diff* testing and have an effect on positive and negative predictive values?

**STUDY DESIGN:** This was an IRB approved single center trial.

**METHODS:** This was an IRB approved study on a nursing driven algorithm for Clostridium difficile Timeout (CDT). This included the number and shape of stools and absence of laxatives in the last 24 hours. Control and study groups were identified and a nurse provided C. diff education to the study group. Nursing utilized the CDT algorithm, and the *C. diff* PCR was sent if criteria were met to optimize testing stewardship. The primary objective was to assess the positive and negative predictive values (PPV and NPV) associated with CDT.

**RESULTS:** There were 87 patients who had CDT performed from June 2017-February 2018. There were 72 patients tested for *C. diff* PCR, and 15 were not tested. Baseline demographics were similar between both groups. Patients in the tested group compared to control were more likely to meet the criteria for >3 loose BMs/day (88% vs 40%, P=0.002) and lack of new start on laxatives (7% vs. 33%, P=0.012). Compared to the control group, there were fewer tests ordered for

the study group (130 vs 160 per 10000PD, P=0.10) and similar positive tests results (26 vs 26 per 10000PD). This led to a PPV of 83.7% and a NPV of 20.3%.

**CONCLUSION:** With CDT utilization, there was a decline in total number of *C. diff* tests ordered. Through this nurse-initiated algorithm, testing stewardship for *C. diff* was optimized and a PPV and NPV was uncovered.

**221. Antimicrobial stewardship at a geriatrics post-acute and long term care setting. how can we do better?** *Kit Chan, RPh, BScPhm*[1], Aidlee Craft, MDCM, CCFP, FCFP[2], Michael Kirzner, MD CCFP[2], Anh Nguyen, MSc, Pharm.D.[3], Samantha Yau, RPh, BScPhm, ACPR, Pharm. D., BCGP[1]; [1]Department of Pharmacy, Baycrest Health Sciences, Toronto, ON, Canada [2]Department of Family Medicine, Baycrest Health Sciences, Toronto, ON, Canada [3]University of Toronto, Toronto, ON, Canada

**INTRODUCTION:** Antimicrobial stewardship programs (ASP) are well established and studied in acute care settings; however gaps exist in the post-acute care and long term care settings.

**RESEARCH QUESTION OR HYPOTHESIS:** To assess physicians' and pharmacists' understanding of antimicrobial stewardship, evaluate utility of current ASP initiatives, increase engagement and improve acceptance of ASP recommendations.

**STUDY DESIGN:** Qualitative study

**METHODS:** Third party interviews were conducted with 22 family physicians and pharmacists from March 10 to 24, 2017. Respondents were asked to rate the impact of current ASP initiatives on their prescribing and practice on a 5-point Likert Scale, comment on barriers to the acceptance of recommendations and provide suggestions to guide future initiatives.

**RESULTS:** Most respondents were able to articulate the purpose of ASP, which aligns with the goals endorsed by Accreditation Canada and the Infectious Diseases Society of America. Newsletter updates provided by the team had the highest impact on practice with a score of 4.5/5, followed by grand rounds (4.4/5), disease-specific guidelines (4.2/5) and antibiograms (3.9/5). ASP recommendations addressing parental to oral antibiotic step down (4.7/5) was rated most impactful, followed by antibiotic selection (4.6/5), therapy duration (4.5/5) and renal dose adjustment (4.3/5). Respondents commented that ASP recommendations often prompted them to reassess antibiotic therapy (4.7/5); however the acceptance was modest (3.7/5). Barriers identified include conflicting recommendations from specialists (i.e. wound care team, geriatrics) and patient/ family perception of the need for antibiotics in presumed infections.

**CONCLUSION:** Majority of clinicians expressed that ASP initiatives have positively impact their prescribing and antimicrobial use practices. Currently, ASP recommendations are guided from chart reviews, which impact the acceptance rates as a result of limited documentation and contribute to delays in communication. Further studies are required to effectively guide ASP initiatives in post-acute care settings and to increase clinician engagement.

**222. Prolonged exposure to β-lactam antibiotics in daptomycin-nonsusceptible staphylococcus aureus re-establishes daptomycin susceptibility** *Rachel Jenson, BS*[1], Sarah Baines, Ph.D.[2], Benjamin Howden, MBBS, Ph.D., FRACP, FRCPA[2], Andrew Berti, Pharm.D., Ph. D., BS[3], Warren Rose, Pharm.D.[4]; [1]University of Wisconsin School of Pharmacy, Madison, WI [2]Melbourne, Australia [3]Detroit, MI [4]School of Pharmacy, University of Wisconsin-Madison, Madison, WI

**INTRODUCTION:** Daptomycin (DAP) activity against daptomycin-nonsusceptible (DNS) MRSA is heightened in presence of β-lactams. Acquisition of DNS has been linked to gain-in-function mutations within the mprF gene. β-lactams prevent mprF mutations during DAP exposure.

**RESEARCH QUESTION OR HYPOTHESIS:** We sought to determine if DNS possessing an mprF mutation becomes more DAP susceptible in the presence of β-lactams and whether this enhanced susceptibility is associated with mprF disruption.

**STUDY DESIGN:** DNS MRSA were exposed in vitro to β-lactams with variable penicillin binding protein (PBP) inhibition profiles via serial daily passage. DAP MIC changes were assessed over time.

**METHODS:** We included 24 MRSA strain-pairs of a daptomycin susceptible and DNS strain derived clinically from DAP treatment. Susceptibility testing was performed against DAP, nafcillin (PBP-nonspecific), and cloxacillin (PBP-1), ceftriaxone (PBP-2), cefoxitin (PBP-4). Three DNS strains were selected for 28-day serial passage experiments with β-lactams at sub-inhibitory concentrations. Daptomycin susceptibility, whole genome sequencing, membrane fluidity, and membrane surface charge studies were then performed.

**RESULTS:** Increases in nafcillin and cloxacillin susceptibility occurred in DNS strains whereas less pronounced effects were noted with ceftriaxone and cefoxitin susceptibility. β-lactam passage enhanced DAP susceptibility by day 28. Of note, cloxacillin was most effective with up to 16-fold decrease in MIC (2 mg/L day 1, then 0.125 mg/L day 28). Additional polymorphisms in mprF located in the synthase or translocase domain and mutation in div1 were observed with cloxacillin. This corresponded to reduced membrane surface charge (P<0.01) and altered membrane fluidity.

**CONCLUSION:** β-lactams binding either all PBPs or specifically to PBP1 have the most pronounced see-saw effect in DNS. Passage in β-lactams, especially PBP1 specific cloxacillin, can resensitize DNS strains to DAP through additional mutations in mprF leading to altered cell membrane function, which is the target of DAP activity.

**223E. Evaluation of Gap in patient knowledge of urinary tract infections in a medically underserved population** *Emi Minejima, Pharm.D.*, Annie Wong-Beringer, Pharm.D.; USC School of Pharmacy, Los Angeles, CA

Presented at American Society of Microbiology, Atlanta, GA, June 9, 2018.

**224. Apoptosis as an underlying molecular mechanism by which proteasome inhibitors kill schistosoma mansoni** *Anh Ta, Pharm.D.*[1],

Conor Caffrey, Ph.D.[2], Anthony O'Donoghue, Ph.D.[2], Nelly El-Sakkary, Ph.D.[3], Betsaida Bibo-Verdugo, MS[4], Steven Wang, BS[5], Brian Suzuki, BS[6]; [1]Skaggs School of Pharmacy, University of California at San Diego, LA JOLLA, CA [2]Skaggs School of Pharmacy, University of California at San Diego, La Jolla, CA [3]Skaggs School of Pharmacy, CDIPD, University of California at San Diego, La Jolla, CA [4]Graduate School of Biomedical Sciences, Sanford Burnham Prebys Medical Discovery Institute, La Jolla, CA [5]Division of Biological Sciences, University of California at San Diego, La Jolla, CA [6]University of California at San Diego, La Jolla, CA

**INTRODUCTION:** Schistosomiasis, caused by the *Schistosoma* blood fluke, is a chronic and painful disease that is associated with poverty in the developing world. The World Health Organization has ranked the disease as the second most neglected tropical disease in terms of socio-economic importance and public health impact. Treatment and control of this disease relies on just one drug, praziquantel (PZQ). PZQ has a number of pharmacological and pharmaceutical drawbacks, and the reliance on just one drug, in any case, raises concerns regarding the possible emergence of drug resistance. Our group is investigating the schistosome proteasome as a possible molecular target for new antischistosomal drugs.

**RESEARCH QUESTION OR HYPOTHESIS:** To understand the antischistosomal activity of various commercially available proteasome inhibitors, including whether pro-apoptotic caspase activity is activated.

**STUDY DESIGN:** *In vitro* whole-organism tests

**METHODS:** Adult *Schistosoma mansoni* worms were incubated with 1 μM of bortezomib, MG-132, carfilzomib or ONX-194. After 24 hour, worm motility, as a marker for antischistosomal activity, was measured using WormAssay. We also employed a fluorometric apoptosis assay to measure caspase proteolytic activity in extracts of worms that had been exposed to inhibitors.

**RESULTS:** The often severe decrease in motility measured for *S. mansoni* in the presence of the proteasome inhibitors correlated well with the induction of caspase activity. Bortezomib was particularly effective, whereas MG-132 neither altered worm motility nor induced caspase activity.

**CONCLUSION:** Our data demonstrate that low micromolar concentrations of proteasome inhibitors are antischistosomal. Similar to mammalian cells, proteasome inhibitors trigger pro-apoptotic caspase activity. Not all of proteasome inhibitors were active and we are investigating the underlying biological and/or chemical basis for this finding.

**225. One-time iv antibiotic administration in the emergency department (ED) in patients discharged home** *Zahra Kassamali, Pharm.D.*[1], Beau Chiba, Pharm.D.[1], Michael Hori, MD[2], Cameron Buck, MD[2]; [1]School of Pharmacy, University of Washington, Seattle, WA [2]UW Medicine, Valley Medical Center, Renton, WA

**INTRODUCTION:** One-time use of IV antibiotics provides unnecessarily invasive drug administration and greater risk vs. oral administration. IV administrations delay ED discharge due to preparation and infusion time.

**RESEARCH QUESTION OR HYPOTHESIS:** We evaluated the rate of one-time IV antibiotic use in the ED to identify quality improvement opportunities.

**STUDY DESIGN:** This was a single-center retrospective quality improvement review conducted in a Seattle metropolitan area ED that sees 84,000 patients annually (~9.5 patients/hour).

**METHODS:** Patients presenting to the ED between 1/1/17 – 12/31/17 who received one of the following IV antibiotics: levofloxacin, ceftriaxone, or vancomycin were included. These antibiotics were selected because they are among the top 5 most prescribed at our institution. We evaluated discharge diagnoses, and rate of home antibiotic prescriptions. Data were evaluated with descriptive statistics.

**RESULTS:** Of 5052 patients who received IV antibiotics in the ED, 1025 (20%) were discharged without inpatient admission. Among those discharged, 90% received IV ceftriaxone, 7% received IV levofloxacin, and 3% received IV vancomycin. Based upon antibiotic infusion time, this represents 564 additional patient-hours spent in the ED. 87% received an antibiotic prescription upon discharge. Two-thirds had an infectious diagnosis. The most common was urinary tract infection (UTI) 61%, followed by respiratory tract infection 21%, and skin and soft tissue infection 5.4%. The top 3 discharge antibiotic prescriptions were for fluoroquinolones 243 (27%), cephalexin 182 (20%), and amoxicillin 155 (17%).

**CONCLUSION:** Administration of IV antibiotics to ED patients not admitted to the hospital contributed 564 hours (almost 24 full days) of waiting time to patients. The high utilization of IV ceftriaxone and fluoroquinolone prescriptions for discharge corresponds with the most frequent diagnosis, UTI. Although some patients may present with nausea/vomiting, the majority of IV antibiotic utilization is unnecessary and represents an opportunity to improve patient safety and improve ED throughput time.

**226. Evaluating adverse consequence of routinely prescribing adult patients antibiotics after an uncomplicated ERCP procedure** *Brittany Faley, BS, Pharm.D. Candidate 2019*[1], Whitni Patterson, Pharm.D. Candidate 2019[1], Josh Kirchner, Pharm.D. Candidate 2019[1], Abigayle Renner, Pharm.D. Candidate 2019[1], Brett Heintz, Pharm.D., BCPS-ID {AQ}, AAHIVE[2]; [1]University of Iowa College of Pharmacy, Iowa City, IA [2]Iowa City Veterans Affairs Health Care System, Iowa City, IA

**INTRODUCTION:** Endoscopic retrograde cholangiopancreatography (ERCP) is an elective surgery to treat issues of the gallbladder and pancreatic ducts. Antimicrobial prophylaxis is not necessary for uncomplicated ERCP; however in high risk cases, guidelines support antimicrobial prophylaxis, limited to 24 hours. Our antimicrobial stewardship program identified a recurring area of antibiotic misuse, which has been the routine use of antimicrobial prophylaxis to patients after an ERCP, in particular with fluoroquinolones of which recently received an FDA safety warning noting serious side effects associated with the class.

**RESEARCH QUESTION OR HYPOTHESIS:** The primary objective was to evaluate antimicrobial prophylaxis and guideline concordance among patients who received an uncomplicated ERCP procedure. Secondary objectives were to evaluate difference among guideline concordant and discordant cases, including antimicrobial duration, antibiotic associated diarrhea, C. difficile infection, resistance, mortality and post-procedure infection rates.

**STUDY DESIGN:** Retrospective, multi-center, cohort.

**METHODS:** ERCP performed between 1/2015 and 6/2016. Electronic medical record chart review.

**RESULTS:** During the study period 1459 cases were evaluated of which 813 met inclusion criteria with an overall guideline concordance rate of 47.2%. The mean duration of antimicrobial prophylaxis was 5.1 days which varied significantly between groups. Guideline concordant cases appeared to be of lower acuity with a lower incidence of cholecystectomy/cholecystostomy, lower albumin levels and repeat ERCP within three months of the index procedure. Among evaluated cases, guideline concordant cases had less antibiotic associated diarrhea and trended towards lower post-ERCP cholangitis and combined C. difficile infection or documented resistance. Cefoxitin was the most common agent prescribed for surgical prophylaxis, while ciprofloxacin was the most common agent prescribed at discharge. Cholecystectomy, biliary/pancreatic malignancy and lower albumin were associated with all-cause mortality upon multivariate regression analysis.

**CONCLUSION:** Guideline discordant therapy was common. Post-ERCP antibiotic-toxicity was more common in the guideline discordant group. Future prospective studies are needed to evaluate the impact of guideline discordant therapy on adverse consequences.

**227. Anti-MRSA agent de-escalation in culture-negative nosocomial pneumonia** Maren Cowley, Pharm.D.[1], David Ritchie, Pharm.D., FCCP, BCPS[2], Nicholas Hampton, Pharm.D.[1], Marin Kollef, MD, FACP, FCCP[3], *Scott Micek, Pharm.D., FCCP, BCPS*[2]; [1]Barnes-Jewish Hospital, Saint Louis, MO [2]Barnes-Jewish Hospital and Saint Louis College of Pharmacy, Saint Louis, MO [3]Barnes-Jewish Hospital and Washington University School of Medicine, Saint Louis, MO

**INTRODUCTION:** In culture-positive nosocomial pneumonia, de-escalation from broad-spectrum empiric antimicrobials to narrower-spectrum agents has been shown to be an effective method of decreasing broad-spectrum antibiotic use without compromising patient outcomes. However, uncertainty exists regarding the safety of anti-MRSA agent de-escalation in culture-negative nosocomial pneumonia.

**RESEARCH QUESTION OR HYPOTHESIS:** This study aimed to determine if anti-MRSA agent de-escalation in culture-negative nosocomial pneumonia affects 28-day mortality.

**STUDY DESIGN:** This single-center retrospective cohort study included adult patients admitted from 2012-2017 with nosocomial pneumonia who had a negative respiratory culture.

**METHODS:** De-escalation was defined as discontinuation of an MRSA agent within four days of initiation. Secondary outcomes included hospital mortality, hospital and ICU length of stay, treatment failure, and occurrence of acute kidney injury.

**RESULTS:** Of 279 patients included, 187 were in the de-escalation (DE) group and 92 were in the no de-escalation (NDE) group. Patients who were not de-escalated received 5 more days of MRSA coverage than patients who were de-escalated; however, there was no difference in 28-day mortality (NDE 28% vs DE 23%; p = 0.33). Patients who were de-escalated had shorter hospital (DE 15 days vs NDE 20 days; p = 0.04) and ICU (DE 10 days vs NDE 13 days; p=0.08) length of stays after the index date. The incidence of AKI was significantly higher in patients who were not de-escalated (DE 36% vs NDE 50%; p = 0.04).

**CONCLUSION:** While anti-MRSA agent de-escalation in culture-negative nosocomial pneumonia did not affect 28-day mortality, it was associated with a shorter hospital stay and lower incidence of acute kidney injury.

**228. A case-case-control study of risk factors and outcomes of multidrug-resistant organisms infections among Singapore's nursing home residents admitted to an acute care hospital** *Jian Wei Heng, Pharm.D.*[1], Guo Shin Christopher Cheah, Bachelor of Science (Pharmacy)[2], Christine Teng, MSc (Clinical Pharmacy)[2]; [1]Department of Pharmacy, Khoo Teck Puat Hospital, Singapore, Singapore [2]Department of Pharmacy, National University of Singapore, Singapore, Singapore

**INTRODUCTION:** Residence in nursing homes (NH) is a healthcare-associated risk factor for multidrug-resistant organisms (MDRO) infections. As a result, empiric broad spectrum antibiotics are frequently prescribed. However, studies have demonstrated that MDRO infections may be lower in NH-acquired infections than hospital-acquired infections.

**RESEARCH QUESTION OR HYPOTHESIS:** Little is known about the risk factors and outcomes of MDRO infections in Singapore's NH population. This research aims to determine the unique risk factors and outcomes for NH-acquired MDRO infections, and establish a predictive tool to aid empiric antibiotic selection.

**STUDY DESIGN:** A case-case-control study was performed at an acute-care hospital.

**METHODS:** Patients admitted from NH within March 2014 – December 2015 were included. Patients with MDRO infections and those with non-MDRO bacterial infections were compared to those without infection as the common control group. Univariate analyses and multiple logistic regressions were conducted. Predictive scoring was developed from significant risk factors and assessed through Receiver Operating Characteristics Curve (ROC).

**RESULTS:** This study included 144, 133 and 144 patients in the MDRO, non-MDRO and Control groups respectively. Logistic regression showed use of fluoroquinolones in the last 90 days (aOR: 5.10, 95% CI: 1.36-19.23), peptic ulcer disease (aOR: 4.47, 95% CI: 1.32-15.08) and history of MDRO colonization in previous 1 year (aOR: 2.88, 95% CI: 1.46-5.67) were unique predictors of MDRO infections. MDRO predictive score ranging 0 to 11 was developed and a score of

≥3 suggested high MDRO risk (sensitivity:0.67, specificity: 0.76), with an Area Under Curve of ROC of 0.762 (95% CI: 0.714-0.811). The 30-day all cause mortality in the MDRO, non-MDRO and Control groups were 20.1%, 20.3% and 2.1% respectively (p<0.001).

**CONCLUSION:** Using the prediction model can help practitioners identify high risk patients who truly require broad spectrum antibiotics. This minimizes its inappropriate use which may lead to antibiotic resistance, unnecessary side effects and costs.

**229. Evaluating the impact of prescriber-specific report cards with peer profiling on fluoroquinolone utilization across a 16-hospital system** *John Allen, Pharm.D., BCPS, BCCCP, FCCM*; Department of Pharmacotherapy and Translational Research, University of Florida College of Pharmacy, Orlando, FL

**INTRODUCTION:** On a daily basis inpatient clinicians have to balance the clear benefits of antibiotics (ABXs), while also attempting to avoid the well-known potentially negative consequences of unnecessary ABX use. Among potential agents for ABX use reduction, fluoroquinolones are an attractive target due to their wide spectrum of activity, known adverse event profile, and availability of less toxic therapeutic options. In January 2017, we began to provide prescriber-specific antibiotic report cards that focused on fluoroquinolone utilization across our 16-hospital system. Individual prescribers were grouped by specialty to allow for peer comparisons.

**RESEARCH QUESTION OR HYPOTHESIS:** Did the implementation of prescriber-specific reports reduce overall fluoroquinolone among inpatient prescribers?

**STUDY DESIGN:** Retrospective, observational, pre-post analysis

**METHODS:** Our study period was defined as April 2016- December 2016 (pre-intervention), and April 2017- December 2017 (post-intervention), respectively. Fluoroquinolone use was assessed using the number of fluoroquinolone days of therapy per 1000 adjusted patient days (DOT/1000 APD) during each study period. Additionally, the overall percent of fluoroquinolone use, compared to total antibiotic use was assessed. Utilization trends by unit type, and specialty were also evaluated. No patient specific data was evaluated. This study was reviewed by the system ethics board, and IRB approval was waived. Based on data distribution, appropriate statistical analysis were used to analyze study results. Only adult, inpatient antibiotic use was considered in this study.

**RESULTS:** Across the hospital system, fluoroquinolone DOT/1000 APD was reduced in the post-intervention period by 30% (facility range: -4 to -47%, p <.05), compared to the pre-intervention period. Additionally, the overall percent of fluoroquinolone days of therapy was reduced by 4% compared to the pre-intervention period (facility range: -2 to -7%, p <.05). No differences were noted according to type of unit.

**CONCLUSION:** The use of prescriber-specific report cards was associated with reduced fluoroquinolone use across a 16- hospital system.

**230. Real-world pharmacoeconomic analysis of penicillin skin testing: scratching the surface at a community hospital** *Kristen Pierce, Pharm.D. Candidate (2019)*[1], Bruce Jones, Pharm.D., BCPS[2], Christopher Bland, Pharm.D., BCPS, FIDSA[3]; [1]UGA College of Pharmacy, Savannah, GA [2]St. Joseph's/Candler Health System, Savannah, GA, GA [3]Clinical and Administrative Pharmacy, University of Georgia College of Pharmacy, Savannah, GA

**INTRODUCTION:** Self-reported penicillin allergies, most of which are not true allergies, are associated with significant morbidity and mortality. While clinical outcomes are documented with penicillin skin testing (PST), pharmacoeconomic outcomes are not well described in the literature. This study evaluated direct antimicrobial costs associated with PST in a cohort of patients tested at a community hospital.

**RESEARCH QUESTION OR HYPOTHESIS:** Administration of PST in appropriate candidates will improve overall antimicrobial costs when directed by stewardship pharmacist.

**STUDY DESIGN:** Retrospective analysis of 100 patients who received PST within a community hospital between January 2016-January 2017.

**METHODS:** Primary outcome measured was total costs associated with PST defined as cost of antimicrobials received before and after PST, including cost of the test (approximately $140). Cost of therapy was calculated on the basis that if patient had not received PST, their antimicrobial regimen would have continued for same duration as antimicrobials received after PST. Secondary outcome evaluated included cost of top 3 antimicrobial changes after PST.

**RESULTS:** One hundred patients completed PST (98/100 tested negative). Average cost savings for all patients was $353.03 per patient. Average cost savings of $556.91 was demonstrated in all patients who received an antimicrobial change (71%) recommended by pharmacist after negative PST. The top 3 changes with average costs were: (1) carbapenem to penicillin/cephalosporin (n=34; savings: $1157.68/patient) (2) cephalosporin to PCN or lower generation cephalosporin (n=13; savings: $70.17/patient) (3) fluoroquinolone to PCN/cephalosporin (n=10; loss: $138.62/patient). Two patients (both initially on carbapenems) contributed significantly to overall cost savings. When removed, average cost savings for the overall change group and carbapenem change group were $138.97 and $307.12 per patient respectively.

**CONCLUSION:** PST offers overall cost savings within a community hospital when directed by a stewardship pharmacist even when accounting for high cost agents. More data is needed to determine the most optimal PST patients from a pharmacoeconomic perspective.

**231. Attitudes, beliefs, and knowledge regarding influenza vaccination amongst hospital healthcare workers** *Ian Wee, MPharm (Clin. Pharm.)*[1], Helen Oh, MBBS, MMed (Int Med)[2], Nicholas Lim, BSc (Pharm.) (Hons.)[1], Claire Lim, BSc (Pharm.)(Hons.)[1]; [1]Department of Pharmacy, Changi General Hospital, Singapore, Singapore [2]Department of Medicine (Infectious Diseases), Changi General Hospital, Singapore, Singapore

**INTRODUCTION:** Because healthcare workers are at increased risk of influenza exposure, the World Health Organization recommends that this group receive an annual influenza vaccination.

**RESEARCH QUESTION OR HYPOTHESIS:** To study the attitudes, beliefs and knowledge regarding influenza vaccination amongst healthcare workers in an acute care hospital.
**STUDY DESIGN:** Prospective, voluntary online survey
**METHODS:** As part of World Immunization Week activities, our healthcare workers were invited to participate in an anonymous online survey. All responses to the 10-statement survey were collected over a 3-week study period in April 2017.
**RESULTS:** A total of 1371 completed surveys were received with 77.9% of these from nurses. Most respondents were aware of local guidelines regarding influenza vaccination (89.8%), and felt that vaccination was important for protection of patients (80.0%) or family/friends (81.2%) and not merely for the elderly (93.9%). Although 36.3% of respondents felt that they were not (or were unsure if they were) at high risk of catching influenza, almost 90% understood that, if infected, they could be responsible for spreading the virus. Slightly over 70% of respondents felt that the influenza vaccine was generally safe but 64.8% were concerned about flu-like side effects. Only 51.1% of respondents were convinced that the vaccine was effective in conferring adequate temporary immunity, while a total of 17.4% were either unconvinced or unsure of the benefits of an annual influenza vaccination as they did not usually come down with influenza.
**CONCLUSION:** A significant proportion of healthcare workers understood how, if infected, they could be the source of spreading the influenza virus to patients and family/friends, as well as the role of vaccination in preventing viral spread. While most respondents felt the vaccine was safe to recipients, only half had doubts about its efficacy. In the absence of frequent influenza infection, almost one in five respondents were also uncertain about the personal benefits of annual influenza vaccination.

**232E. Evaluation of Sepsis-3 vs SIRS to identify patients at risk for mortality in enterobacteraciae infections** *Amy Kang, Pharm.D.*[1], Dominique Werge, Pharm.D.[2], Emi Minejima, Pharm.D.[1]; [1]USC School of Pharmacy, Los Angeles, CA [2]Department of Pharmacy, Los Angeles County+University of Southern California Medical Center, Los Angeles, CA
Presented at the American Society of Microbiology Microbe, Atlanta, GA, June 7-11, 2018.

**233. Impact of an AUC-guided versus trough-guided vancomycin dosing strategy** *Emily Heil, Pharm.D., BCPS AQ ID*[1], Patricia Callahan, Pharm.D. Candidate[2], Ana Vega, Pharm.D.[2], Kimberly Claeys, Pharm. D., BCPS[1]; [1]University of Maryland School of Pharmacy, Baltimore, MD [2]Department of Pharmacy Practice and Science, University of Maryland School of Pharmacy, Baltimore, MD
**INTRODUCTION:** Area under the concentration-time curve (AUC): minimum inhibitory concentration ratio is the ideal pharmacokinetic/pharmacodynamic descriptor of vancomycin (VAN) activity and allows for lower doses of VAN and potentially less nephrotoxicity. An AUC-guided, pharmacist-managed dosing strategy for VAN was launched at the University of Maryland Medical Center in January 2017.
**RESEARCH QUESTION OR HYPOTHESIS:** AUC-based dosing is associated with lower VAN doses and therefore lower rates of VAN-associated nephrotoxicity compared to a trough-based dosing strategy.
**STUDY DESIGN:** Quasi-experimental pre/post-evaluation
**METHODS:** Retrospective review of adult patients pre-(October/November 2016) and post-(November/December 2017) implementation of AUC-based VAN dosing. Patients in the post-group were matched 1:1 to patients in the pre-group on age (5 years), ICU admission, and number of concurrent nephrotoxic agents. The primary endpoint was incidence of VAN-associated nephrotoxicity pre- versus post-implementation. Secondary endpoints included target attainment, number of appropriately drawn VAN levels, and total daily VAN dose. Categorical variables were compared using Chi-squared or Fisher's Exact test, categorical were compared using Wilcoxon signed-rank test, as appropriate.
**RESULTS:** 148 patients were matched: median age was 60 years, median one concurrent nephrotoxic agent in both groups, and 17.5% were in the ICU. Target attainment was 20.5% pre- versus 38.5% post-implementation ($p$ = 0.102). Six (8.1%) patients in the pre- versus one (1.4%) in the post-group developed VAN-associated nephrotoxicity ($p$ = 0.058). Average total daily dose (mg/kg) of VAN was similar in both groups (23.7 IQR [17.4 – 30.3] versus 26.1 IQR [18.4 – 33.4]). The number of levels post-implementation was higher (1 [range 0 – 18] versus 3 [range 0 – 10]) but the number appropriately drawn/day of therapy was also significantly higher (0.14 [IQR 0 – 0.35] versus 0.6 [IQR 0.32 – 0.95], $p$ < 0.0001) post-implementation.
**CONCLUSION:** An AUC-based vancomycin dosing strategy was associated with numerically lower rates of VAN-associated nephrotoxicity compared to a trough-based dosing strategy; resource utilization was similar.

**234E. Oral vancomycin plus intravenous metronidazole for severe Clostridium difficile infection in critically ill patients** Ana Vega, Pharm.D.[1], Sikemi Ibikunle, MD Candidate[2], Teri Hopkins, Pharm.D., BCPS[3], Emily Heil, Pharm.D., BCPS AQ ID[4], Surbhi Leekha, MBBS, MPH[2], Jennifer Johnson, Ph.D., D(ABMM)[2], *Kimberly Claeys, Pharm.D., BCPS*[4]; [1]Department of Pharmacy Practice and Science, University of Maryland School of Pharmacy, Baltimore, MD [2]University of Maryland School of Medicine, Baltimore, MD [3]Pharmacy, South Texas Veterans Health Care System, San Antonio, TX [4]University of Maryland School of Pharmacy, Baltimore, MD
Presented at IDWeek 2018, San Francisco, CA, October 3-7, 2018.

**235. Sustained virologic response rates after hepatitis c virus therapy in treatment-naïve patients at an urban academic medical center** *Michelle T. Martin, Pharm.D.*[1], Yu-Han Chen, Pharm.D. Candidate[2], Nadia Nabulsi, BS, MPH[3], Todd Lee, Pharm.D., Ph.D.[3]; [1]Pharmacy Practice, University of Illinois at Chicago College of Pharmacy/

University of Illinois Hospital and Health Sciences System, Chicago, IL [2]University of Illinois at Chicago College of Pharmacy, Chicago, IL [3]Pharmacy Systems, Outcomes and Policy, University of Illinois at Chicago College of Pharmacy, Chicago, IL

**INTRODUCTION:** Direct-acting antiviral regimens (DAAs) offer high sustained virologic response (SVR) rates for hepatitis C virus (HCV) treatment. Treatment-naïve patients have high cure rates in clinical trials, and it is estimated that 75% of the HCV patients in the United States are still treatment- naïve.

**RESEARCH QUESTION OR HYPOTHESIS:** What are HCV SVR rates among treatment-naïve patients treated with dual-DAA therapy at an urban academic medical center?

**STUDY DESIGN:** A retrospective cohort study.

**METHODS:** Investigators reviewed electronic records of patients who received HCV treatment from 1/1/2014 to 12/1/2017. Treatment-naïve patients who started dual-DAA regimens were included in the analysis. Data were described with counts/percentages for categorical data and means/standard deviations for continuous data. The primary endpoint was SVR; rates were compared using chi-square tests and SAS software.

**RESULTS:** Of the 822 HCV-treated patients, 561 (68%) fit inclusion criteria; their intent-to-treat SVR rate was 88% (492/561). Patients were 62% male, 63% black, had a mean age of 59.7 (+8.9) years, BMI of 29.2 (+6.6) kg/m$^2$, and 43% had Medicaid. In addition, 92% had genotype 1, 47% had cirrhosis (Metavir stage F4), 4% had hepatocellular carcinoma (HCC), 28% had diabetes, 25% had psychiatric illness, 9% were post-transplant, and 66% received ledipasvir/sofosbuvir±ribavirin. Excluding 35 patients lost-to-follow-up and 14 who discontinued treatment, the SVR rate was 96% (492/512) per protocol. It differed by stage (F0/F1/F2=100%, F3=97%, F4=93%; p=0.0055). SVR rates differed by gender (females=98% vs males=95%, p=0.0313), and HCC (no HCC=97% vs HCC=86%; p=0.0122). SVR did not differ by genotype, race/ethnicity, age, obesity, comorbidities, or insurance (p>0.05).

**CONCLUSION:** Naïve patients had high SVR rates and comprised a large proportion of this diverse HCV population. Gender differences in DAA SVR rates have not yet been reported in the literature. Non-cirrhotics had higher SVR rates than cirrhotics. HCC typically develops in cirrhosis; a low SVR rate was seen in HCC patients. These results support HCV treatment prior to progression to cirrhosis to allow for improved SVR rates.

**236. Oral fluoroquinolones for definitive treatment of gram-negative bacteremia in cancer patients** Justin Tossey, Pharm.D.[1], Zeinab El Boghdadly, MBBCh[2], Erica Reed, Pharm.D., BCPS-AQ ID[1], Jennifer Dela-Pena, Pharm.D., BCPS[3], Kelci Coe, MPH[2], Sherry Williams, Pharm.D., BCOP[1], Kurt Stevenson, MD, MPH[2], *Lynn Wardlow, Pharm. D., MBA, BCPS-AQ ID*[1]; [1]Department of Pharmacy, The Ohio State University Wexner Medical Center, Columbus, OH [2]Department of Internal Medicine, Division of Infectious Diseases, The Ohio State University Wexner Medical Center, Columbus, OH [3]Department of Pharmacy, Advocate Health Care, Park Ridge, IL

**INTRODUCTION:** Bloodstream infections (BSI) are significant causes of morbidity and mortality in cancer patients, occurring in 10-25% of neutropenic patients and up to 55% of hematopoietic stem cell transplantation (HSCT) recipients. With increasing rates of gram-negative BSIs, limited data exists on whether cancer patients may be safely transitioned to an oral (PO) antibiotic.

**RESEARCH QUESTION OR HYPOTHESIS:** Are treatment outcomes in cancer patients that receive IV-to-PO fluoroquinolone (FQ) transition comparable to IV therapy for gram-negative bacteremia?

**STUDY DESIGN:** Single-center, retrospective cohort study.

**METHODS:** All patients transitioned to a PO FQ within five days of their first positive blood cultures between November 1, 2011 and September 30, 2017 were included in the IV-to-PO group, which was compared to those who continued IV therapy. The primary outcome of treatment failure was the composite of 30-day recurrence, 30-day infection-related readmission, and inpatient mortality. Secondary outcomes assessed included infection-related length of stay (LOS), hospital LOS, and adverse events, including *Clostridioides difficile* infection and catheter-related complications (e.g. thrombosis). The primary outcome was evaluated using the chi-square test. Confounding factors (e.g. Pitt bacteremia score) were accounted for using logistic regression modeling. Categorical variables were compared using chi-square or Fisher's exact test, while continuous data were analyzed using the student's t-test or Wilcoxon rank-sum test for parametric and nonparametric data, respectively.

**RESULTS:** The IV and IV-to-PO groups included 152 and 83 patients, respectively. Differences in baseline characteristics included higher incidence of neutropenia, hematologic malignancy, HSCT, and ICU admissions in the IV group. Patients in the IV group experienced significantly more treatment failure (22% vs 8%, p<0.01), which persisted within the regression model (aOR 3.66, 95% CI 1.40-8.90). A significant decrease in hospital LOS, infection-related LOS, and catheter-related complications were found in the IV-to-PO group.

**CONCLUSION:** Low rates of treatment failure were observed in cancer patients transitioned to a PO FQ for gram-negative bacteremia.

**237. Predictors of treatment failure following de-escalation to a fluoroquinolone in culture negative nosocomial pneumonia** *Amanda Bultas, Pharm.D.*[1], Amit Bery, MD[1], Eli Deal, Pharm.D., BCPS[1], Aaron Hartmann, Pharm.D., BCPS[1], Sara K. Richter, Pharm.D., BCPS[2], William Call, Pharm.D., BCPS[1]; [1]Barnes-Jewish Hospital, St. Louis, MO [2]St. Louis College of Pharmacy, St. Louis, MO

**INTRODUCTION:** Recommendations for de-escalation of antimicrobial therapy in the setting of nosocomial pneumonia without positive cultures are lacking. Clinically, patients are often de-escalated to a fluoroquinolone upon clinical improvement, although little data is available to support this practice.

**RESEARCH QUESTION OR HYPOTHESIS:** What are predictors of treatment failure following de-escalation to a respiratory fluoroquinolone in culture negative nosocomial pneumonia?

**STUDY DESIGN:** Retrospective cohort study.

**METHODS:** Cohort entry included patients admitted from January 1, 2011 to July 1, 2017 with a diagnosis of nosocomial pneumonia and positive chest radiography who received at least 24 hours of fluoroquinolone monotherapy following at least 24 hours of appropriate empiric antibiotics. Treatment failure was defined using a composite of all-cause death within 30 days of discharge, treatment re-escalation, or readmission for pneumonia within 30 days of discharge. Univariate and multivariate analyses were performed using Cox proportional hazards model, with empiric antibiotic duration selected a priori for inclusion in multivariate analysis. Exploratory predictors were included in multivariate analysis based on a pre-defined algorithm involving significance in univariate analysis and clinical applicability.

**RESULTS:** Twenty-three (14%) of 164 included patients failed de-escalation. Empiric antibiotic duration (68.5 ±32.1 hours vs. 65.8 ±35 hours) was not associated with treatment failure in univariate (HR: 1.002 [95%CI 0.991-1.013]) or multivariate analyses (HR: 1.003 [95% CI 0.991-1.015]). Active cancer, ICU admission at empiric initiation, APACHE II score, and steroid use ≥20mg prednisone equivalent during index hospitalization were associated with treatment failure on univariate analysis. ICU admission at empiric initiation (HR: 2.439 [95%CI 1.048-5.676]) and steroid use ≥20mg prednisone equivalent (HR: 2.946 [95%CI 1.281-6.772]) were associated with treatment failure on multivariate analysis.

**CONCLUSION:** Empiric antibiotic duration does not influence failure of de-escalation to fluoroquinolone monotherapy in culture negative nosocomial pneumonia. Impact of exploratory predictors on treatment failure should be assessed in further studies.

**238. Effect of body weight on clinical outcomes of obese patients treated with cephalosporins** Austin R. Morrison, Pharm.D.[1], Johnathon T. Loper, Pharm.D.[2], Katie E. Barber, Pharm.D.[3], Kayla R. Stover, Pharm.D., BCPS-ID[3], *Jamie L. Wagner, Pharm.D.*[3]; [1]Department of Pharmacy, Henry Ford Hospital, Detroit, MI [2]Department of Pharmacy, Baptist Memorial Hospital – North Mississippi, Oxford, MS [3]Department of Pharmacy Practice, University of Mississippi School of Pharmacy, Jackson, MS

**INTRODUCTION:** Differences in pharmacokinetics/pharmacodynamics for obese patients (OB) exist, but clinical safety and efficacy data for package insert-dosing in OB are lacking. The purpose was to evaluate clinical outcomes of cephalosporin-treated OB.

**RESEARCH QUESTION OR HYPOTHESIS:** Does obesity impact clinical outcomes in patients treated with ceftriaxone or cefepime?

**STUDY DESIGN:** Retrospective cohort

**METHODS:** Adult inpatients who received ceftriaxone(CRO) or cefepime(CFP) as definitive therapy for >72hrs from 01/2015-08/2017 were included. Patients with lack of source control at 72hrs or polymicrobial infection were excluded. The primary outcome was clinical treatment failure (therapy change at >72hrs for clinical worsening, leukocytosis or fever for >72hrs, infection-related readmission within 30 days) in OB vs. non-obese patients(NOB). Secondary outcomes included discharge disposition and 30-day-readmission. Descriptive/inferential statistics were performed with SPSS(v24.0); alpha of 0.05 was statistically significant.

**RESULTS:** Two-hundred-fifteen patients were included (97OB, 118NOB; 101 received CRO, 114CFP). Median[IQR] age 60[48-69] years; 122(57%) males. Median[IQR] weight was 104.3[85.3-123.35] kg in OB, 68[60.375-81.025]kg in NOB. Charlson score was similar (3OB vs 2NOB; p=0.130). Common infection sources included urine (42.3%; 38% OB vs 45.8% NOB [p=0.261]) and sputum (40.5%; 48.5% OB vs 33.9% NOB [p=0.030]). CRO regimens were 1-2g every 24hrs(OB) and 1g every 24hrs(NOB); both groups received CFP 1g every 8hrs. Clinical failure occurred in 50.2% (64.9% OB vs 38.1% NOB; p<0.001), with 48.5% CRO (61.5% OB vs 40.3% NOB; p=0.038) and 51.8% CFP (67.2% OB vs 35.7% NOB; p=0.001). Inpatient all-cause-mortality occurred in 13.5% (18.6% OB vs 9.3% NOB; p=0.029); 8.9% CRO (55.5% OB vs 44.4% NOB; p=0.302); 17.5% CFP (65% OB vs 35% NOB; p=0.164). Common discharge dispositions were home(45.6%) and rehabilitation(30.2%). Within 30 days, 33 (15.3%) had infection-related-readmission.

**CONCLUSION:** OB utilized similar-to-higher doses of CRO and similar doses of CFP compared to NOB. OB had increased treatment failure and mortality when treated with CRO or CFP compared to NOB.

**239. Impact of selective antibiotic susceptibility reporting on broad-spectrum antibiotic use across seven hospitals: an ecological study** *Steven Smoke, Pharm.D., BCPS*[1], Luigi Brunetti, Pharm.D., MPH, BCPS, BCGP[2], Navaneeth Narayanan, Pharm.D., BCPS[3], Pamela Giordano, Pharm.D., BCPS[4], Louis Alerte, MS[5], Karan Raja, Pharm.D., BCPS[6], Monica Shah, Pharm.D.[7], Kristine Sobolewski, Pharm.D.[8], Jessica Hill, Pharm.D., BCPS, BCACP[9], Jesse Sullivan, Pharm.D., BCPS[10], Gargi Patel, BS, Pharm.D.[9], Joseph Cavanaugh, Pharm.D., BCPS, BCCCP[9], Maria DeVivo, Pharm.D., MPA, BCPS, BCACP[1], Indu Lew, Pharm.D.[11], Robert T. Adamson, Pharm.D.[11]; [1]Pharmacy, Jersey City Medical Center, Jersey City, NJ [2]Department of Pharmacy Practice and Administration, Rutgers, The State University of New Jersey, Piscataway, NJ [3]Pharmacy Practice and Administration, Rutgers, The State University of New Jersey, Piscataway, NJ [4]Pharmacy, Morristown Medical Center, Morristown, NJ [5]Decision Support, RWJBarnabas Health, West Orange, NJ [6]Clara Maass Medical Center, Belleville, NJ [7]Pharmacy, Monmouth Medical Center, Long Branch, NJ [8]Pharmacy, Saint Barnabas Medical Center, Livingston, NJ [9]Pharmacy, Community Medical Center, Toms River, NJ [10]Pharmacy Practice, Fairleigh Dickinson University, School of Pharmacy and Health Sciences, Florham Park, NJ [11]Corporate Pharmacy, RWJBarnabas Health, West Orange, NJ

**INTRODUCTION:** Recent national estimates of inpatient antibiotic use report that broad-spectrum antibiotic use has increased significantly. National guidelines identify that selective antibiotic susceptibility reporting can decrease broad-spectrum antibiotic use. Limited evidence describes the impact of this intervention on overall antibiotic use within a health system.

**RESEARCH QUESTION OR HYPOTHESIS:** Does selective antibiotic susceptibility reporting reduce overall broad-spectrum antibiotic use within a health system?

**STUDY DESIGN:** This is a retrospective pre- and post-interventional ecological study conducted at a seven hospital health system.

**METHODS:** Standardized selective antibiotic susceptibility reporting rules were developed and implemented between January 2016 and June 2017 for the seven hospitals in the study. The eight months before and after each individual hospital's implementation constituted the pre- and post-interventional study periods. The primary outcome was the rate of broad-spectrum antibiotics for hospital onset/multi-drug-resistant infection (Broad MDR) use. Secondary outcome measures were the use rates of non-glycopeptide anti-MRSA agents, carbapenems, non-carbapenem anti-pseudomonal beta-lactams, 3rd generation cephalosporins, 1st/2nd generation cephalosporins, fluoroquinolones and narrow spectrum penicillins. Antibiotic use data was collected as inpatient intravenous antibiotic days of therapy per 1000 patient days (DOT/1000-PD). Interrupted time series analysis with segmented regression was used to compare outcomes using IBM SPSS v25.0.

**RESULTS:** There was no significant change in use of Broad MDR agents (slope change, +0.54 DOT/1000-PD per month, 95%CI -1.78 to 2.87). The slope change of carbapenem use was -0.77 DOT/1000-PD per month (95%CI -1.58 to 0.05). The slope change of fluoroquinolone use was +0.68 DOT/1000-PD per month (95%CI -0.08 to 1.45). No significant change in the use of other antibiotic classes was detected.

**CONCLUSION:** The implementation of selective antibiotic susceptibility reporting across seven hospitals had no impact on overall broad-spectrum antibiotic use. Further study to determine the long term impact of this intervention is needed.

**240E. Randomized trial evaluating the immunogenicity of high dose vs. standard dose influenza vaccine in IBD patients on antiTNF monotherapy** Freddy Caldera, DO[1], Sumona Saha, MD[2], Arnold Wald, MD[3], Ian Grimes, MD[3], Luke Hillman, MD[4], *Youqi Zhang, Pharm.D. Candidate*[5], Mark Reichelderfer, MD[3], Mary Hayney, Pharm.D., MPH[6]; [1]Medicine/Division of Gastroenterology & Hepatology, University of Wisconsin School of Medicine and Public Health, University of Wisconsin-Madison, Madison, WI [2]Medicine/Division of Gastroenterology & Hepatology, University of Wisconsin-Madison, Madison, WI [3]Medicine/Division of Gastroenterology & Hepatology, School of Medicine and Public Health, University of Wisconsin-Madison, Madison, WI [4]School of Medicine and Public Health, University of Wisconsin-Madison, Madison, WI [5]School of Pharmacy, University of Wisconsin-Madison, Madison, WI [6]School of Pharmacy and School of Medicine and Public Health, University of Wisconsin-Madison, Madison, WI

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**241. Hepatitis b immunity among health care workers immunized as young children** *Mary Hayney, Pharm.D., MPH*[1], Alicia Ritscher, Pharm. D.[2], Megan LeClair-Netzel, DNP, RN[3], Mallory Wagner, AS, AAS[4], Nicole Kalscheur, MSN, RN[4], Danielle Howard-Stewart, MA[5], Freddy Caldera, DO[6]; [1]School of Pharmacy and School of Medicine and Public Health, University of Wisconsin-Madison, Madison, WI [2]School of Pharmacy, University of Wisconsin-Madison, Madison, WI [3]University of Wisconsin Hospital and Clinics, University of Wisconsin-Madison, Madison, WI [4]University of Wisconsin Hospital and Clinics, Madison, WI [5]University of Wisconsin-Madison School of Pharmacy, Madison, WI [6]Medicine/Division of Gastroenterology & Hepatology, University of Wisconsin School of Medicine and Public Health, University of Wisconsin-Madison, Madison, WI

**INTRODUCTION:** Individuals who received the primary three-dose hepatitis B vaccine series (0, 1-2, and 6 months) following the 1991 Advisory Committee on Immunization Practices recommendation to vaccinate infants are now entering the workforce. It is important to study the immunity of young health care workers (HCWs) immunized as children because hepatitis B surface antibody concentrations (anti-HBs) can wane over time, and health care personnel exposed to body fluids are at increased risk for infection.

**RESEARCH QUESTION OR HYPOTHESIS:** What percent of young HCWs who received the hepatitis B vaccine series as children have unmeasurable anti-HBs (<10 mIU/ml)? How many mount an anamnestic response following a booster hepatitis B dose demonstrating that additional doses of vaccine were unnecessary?

**STUDY DESIGN:** Single center, retrospective review

**METHODS:** De-identified information about employees born on or after 1/1/1991 was obtained from Employee Health Services, including hepatitis B immunization records, age at hire, sex, anti-HBs concentrations and dates collected. Individuals who did not complete the three-dose hepatitis B series prior to age 7 years or had more than three doses prior to an anti-HBs level measured were excluded. Anti-HBs <10 mIU/ml were interpreted as unmeasurable.

**RESULTS:** ±1.7 years, and 51% (507) had an unmeasurable anti-HBs at time of hire. Of these 507 HCW, 446 (88%) received documented fourth dose of hepatitis B vaccine followed by another anti-HBs ≥28 days post vaccination; 11% (50/446 or 5% of the total population) did not mount an anamnestic response.

**CONCLUSION:** Half of the young HCWs entering the workforce have undetectable anti-HBs but remain protected from infection. Only 5% of this population require a second vaccine series. This suggests screening this population of HCWs at the time of hire for hepatitis B immunity may be unnecessary.

**242. Assessment of antimicrobial stewardship knowledge after completion of a training program** *Taylor Steuber, Pharm.D., BCPS*[1], Spencer Durham, Pharm.D. BCPS (AQ-ID)[2]; [1]Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Huntsville, AL [2]Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Auburn, AL

**INTRODUCTION:** Antimicrobial resistance is increasing at an alarming rate on a worldwide scale. Antimicrobial stewardship (AMS), defined as coordinated efforts to promote the appropriate use of antimicrobial agents, can help decrease antimicrobial resistance. However, few healthcare providers have the knowledge required to adequately perform AMS.

**RESEARCH QUESTION OR HYPOTHESIS:** After attending a summit conference, healthcare providers will feel more knowledgeable about AMS.

**STUDY DESIGN:** Prospective survey of healthcare professionals (pharmacists, nurses, nurse practitioners, and physicians) participating in a one-day summit on AMS.

**METHODS:** Alabama's Summit on Antimicrobial Stewardship was a statewide, six-hour, continuing education conference that involved four healthcare disciplines. Anonymous surveys were administered to participants one week prior and one week after the summit. They were asked about AMS in their practice, as well as to rank on a scale from "1-strongly disagree" to "5-strongly agree" their confidence in knowledge of the following areas relating to AMS: antimicrobial agents; regulatory requirements of AMS; inpatient, outpatient, and long-term-care facility AMS initiatives; and statewide AMS initiatives. Responses were matched and changes were analyzed using Wilcoxon Signed Rank tests. A p-value <0.05 was considered statistically significant.

**RESULTS:** A total of 158 participants attended the summit. Of those, 74 (47%) and 39 (25%) completed the pre-survey and post-survey, respectively, and 21 (13%) completed both surveys. For matched surveys, significant improvements were seen in confidence in knowledge in all areas: antimicrobial agents (p=0.016); regulatory requirements of AMS (p<0.001); inpatient (p<0.001), outpatient (p=0.003), and long-term-care facility (p<0.001) AMS initiatives; and statewide AMS initiatives (p<0.001). Median responses by the post-survey were "4-agree" for all questions.

**CONCLUSION:** Alabama's Summit on Antimicrobial Stewardship was an effective endeavor. The program improved healthcare professionals' confidence in knowledge in all areas of AMS that were covered. Efforts should be made to continue to provide AMS education to healthcare providers.

**243. Assessment of outpatient antibiotic prescribing to guide antibiotic stewardship initiatives at university affiliated health clinics** Bryant Hammershaimb, Doctor of Medicine candidate[1], *Daniel Chung, Doctor of Pharmacy candidate*[2], Jonathan Tracey, Doctor of Pharmacy candidate[3], Glenn Dregansky, DO, FAAFP[4], Alyssa Woodwyk, MS[5], Heather Rauch, BS[5], Michael Klepser, Pharm.D., FCCP, FIDP[6]; [1]Western Michigan University College of Medicine, Kalamazoo, MI [2]Ferris State University College of Pharmacy/Spectrum Health Butterworth Hospital, Grand Rapids, MI [3]Ferris State University College of Pharmacy, Big Rapids, MI [4]Homer Stryker M.D. School of Medicine, Western Michigan University, Kalamazoo, MI [5]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI [6]Ferris State University College of Pharmacy, Grand Rapids, MI

**INTRODUCTION:** Understanding baseline antibiotic use is the first step in developing outpatient antimicrobial stewardship initiatives. Simple and standardized methods for assessing outpatient antibiotic usage patterns have not been widely accepted historically.

**RESEARCH QUESTION OR HYPOTHESIS:** The objectives of this study were to establish a baseline for oral antibiotic use at two clinic systems, compare usage patterns, and identify opportunities for stewardship initiatives.

**STUDY DESIGN:** Multi-clinic, retrospective analysis.

**METHODS:** Episodes of oral antibiotic use were identified from January 2016 to July 2017 at two outpatient clinic systems. Patients prescribed an oral antibiotic were identified and the indication for use was established using linked ICD10 codes. The Prescribed Therapeutic Regimen (PTR=Dose x frequency x duration), was calculated for each prescription. Compliance with guidelines was determined by comparing the prescribed agent and PTR to recommended antibiotics and a Recommended Therapeutic Regimen (RTR) derived from guideline endorsed regimens. Antibiotic usage rates were estimated using binomial 95% confidence intervals. Frequencies and proportions were used for examining compliance of prescribing with guidelines. Data between clinics was compared.

**RESULTS:** A total of 49,680 and 18,493 visits occurred for 17,112 and 9,153 patients at each of the clinic systems over the study period. The global rates of antibiotic prescribing were 516 and 206 antibiotics per 1,000 patients or 178 and 102 antibiotics per 1,000 visits, for each clinic system respectively. Analysis of compliance with guideline recommendations revealed that 47% and 50% of antibiotics selected and 46% and 54% of dosing regimens prescribed were not guideline-compliant at each system respectively.

**CONCLUSION:** We established baseline rates of oral antibiotic use for each clinic and identified differences in prescribing patterens between the systems. We observed high rates of non-compliance per published guidelines, for a number of indications. Efforts to improve compliance with guidelines will be our first outpatient stewardship initiative.

**244. Comparative pharmacodynamics of cefepime and cefepime-zidebactam against gram-negative organisms** *Madison Salam, Pharm. D. candidate*[1], Roger White, Pharm.D.[2]; [1]College of Pharmacy, Medical University of South Carolina, Charleston, SC [2]MUSC department of Biomedical Science, Charleston, SC

**INTRODUCTION:** Cefepime-zidebactam is a cephalosporin/beta-lactamase inhibitor combination in development for treatment of resistant Gram-negative organisms. Cefepime is frequently used to treat serious Gram-negative infections. We utilized Monte Carlo Analysis (MCA) to assess the potential role of these agents in the treatment of Gram-negative infections.

**RESEARCH QUESTION OR HYPOTHESIS:** Are there differences in target attainment between cefepime and cefepime-zidebactam against Gram-negative organisms?

**STUDY DESIGN:** Monte Carlo analysis (MCA).

**METHODS:** Pharmacokinetic (PK), pharmacodynamic (PD), and MIC data (4 wild-type MIC distributions and ESBL+ E. coli) were collected from peer-reviewed literature. Protein binding, volumes from normal and infected patients, clearance (from a CrCl vs. Cl regression) and PD

targets representing stasis (no net bacterial killing) and 1-log bacterial killing, were used. Two dosage regimens, one based on the cefepime label (Label), and an experimental regimen (Experimental) were assessed. Using 1-compartment PK equations and our inpatient CrCl distribution, steady-state serum PK profiles were simulated (n=10,000). Using these profiles and the MICs, free T>MIC (fT>MIC, % of the interval) was calculated. Target attainment (TA%) results are displayed below (80 kg patient only).

**RESULTS:** TA% changes due to differences in volume (<15%) and the experimental dosage regimen (<14%) were minimal for most drugs/organisms.

| | % Target Attainment (Label / Experimental Regimen) | |
|---|---|---|
| **Organism** | **Cefepime** | **Cefepime-Zidebactam** |
| P. aeruginosa | 84 / 98 | 99 / 100 |
| Enterobacteriaceae | 89 / 89 | 100 / 100 |
| S. marcescens | 98 / 100 | 100 / 100 |
| E. coli | 89 / 90 | 100 / 100 |
| ESBL E. coli | 48 / 50 | 100 / 100 |

**CONCLUSION:** Target attainment for cefepime suggests that it may still be appropriate empirical therapy for many Gram-negative infections; however, cefepime-zidebactam had higher target attainment for all organisms and, as expected, the difference was most striking against ESBL+ E. coli. Clinical trials are needed to assess differences in clinical efficacy between these agents.

**245. Prevalence of beta-lactam allergy in a community hospital** *Karan Raja, Pharm.D., BCPS*, Ruben Patel, Pharm.D., BCPS, Mark Attalla, Pharm.D., Mitesh Patel, Pharm.D., BCCCP and Mona Philips, RPh, MAS; Clara Maass Medical Center, Belleville, NJ

**INTRODUCTION:** Beta-lactam allergies are reported in 8-20% of patients depending on the evaluated population. Beta-lactam allergy documentation is associated with increased use of second line antimicrobials that may be less effective, more toxic, or more costly. Appropriate evaluation of drug allergy documentation and associated reactions in hospitalized patients may yield a consequential and immediate benefit. Data suggests prevalence of documented beta-lactam allergies is greater in hospitalized patients, as compared to perioperative and outpatients. However, limited data exists to describe prevalence in non-teaching community hospital inpatients.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the one-year prevalence of reported inpatient beta-lactam allergies in a community hospital?

**STUDY DESIGN:** Retrospective electronic medical record analysis

**METHODS:** The electronic medical record was queried for all documented allergies and associated reactions for patient encounters from January 1 – December 31, 2017. Our primary outcome assessed prevalence of documented beta-lactam allergies. Secondary outcomes evaluated, characterized, and quantified drug classes of interest and their documented reactions. Descriptive statistics were used to analyze data.

**RESULTS:** There were 131,150 unique patient encounters in 2017. The prevalence of documented beta-lactam allergy was 10.2% (n=13,380). Ninety-two percent of patients were allergic to a penicillin, 6% to a cephalosporin, and <1% to a carbapenem or monobactam. A reaction to the allergy was documented in 11.9% (n=1,582) of these patients. Penicillin most frequently had a reaction documented (69%), followed by piperacillin-tazobactam (6.3%), and amoxicillin (6.2%). The most commonly documented reactions were rash/hives (66%), facial swelling (9%), and pruritus (4.5%). Eighty-two patients (4.3%) were documented having an anaphylactic reaction.

**CONCLUSION:** The prevalence of beta-lactam allergies of inpatients at our facility matches previously published estimates. Documented descriptions of allergic reactions are inconsistent or lacking. Increasing documented reactions to drug allergies presents an opportunity to improve patient safety and stewardship endeavors.

**246. Perceptions of a transition to an auc-guided pharmacist-to-dose vancomycin practice at a large academic medical center** *Kimberly Claeys, Pharm.D., BCPS*[1], Teri Hopkins, Pharm.D., BCPS[2], Jessica Brown, Ph.D.[3], Emily Heil, Pharm.D., BCPS AQ ID[4]; [1]University of Maryland School of Pharmacy, Baltimore, MD [2]Pharmacy, South Texas Veterans Health Care System, San Antonio, TX [3]Department of Epidemiology and Public Health, University of Maryland School of Medicine, Baltimore, MD [4]Department of Pharmacy Practice and Science, University of Maryland School of Pharmacy, Baltimore, MD

**INTRODUCTION:** An AUC-based pharmacist-to-dose vancomycin policy was implemented at the University of Maryland Medical Center (UMMC) January 2017. Given the large practice and methodology changes, we sought to understand pharmacists' perceptions of the practice before and after implementation.

**RESEARCH QUESTION OR HYPOTHESIS:** How will pharmacists' perceptions of an AUC-based pharmacist-to-dose strategy change after implementation?

**STUDY DESIGN:** Pre/post implementation survey

**METHODS:** A mixed methods survey was sent to all pharmacists completing training at UMMC one month prior and eight months after an AUC-based pharmacist-to-dose practice roll-out. Comparisons were made using Chi-squired/Fisher's Exact or Mann-Whitney U Tests.

**RESULTS:** 127 responses were recorded: 78 in the pre-implementation and 49 in the post-implementation groups. Clinical specialist pharmacist represented 53.8% vs 49.0%, clinical pharmacists 32.1% vs 36.7%, and residents 14.3% vs 14.1%. Prior to implementation, 42.3% responded that AUC was the ideal PK/PD parameter to monitor vancomycin, compared to 93.9% post ($p < 0.0001$). Weight-based dosing was primarily used before implementation (46.2% vs 6.1%, $p < 0.0001$). The average time spent evaluating a dose increased from 8 (IQR 5 – 15) min to 15 (IQR 10 – 17.5) min, $p < 0.0001$. Respondents strongly agreed that AUC-based pharmacist-to-dose strategy allowed them to work at the top of their degrees (53.1% vs 61.5%, $p = 0.261$) and

increases patient safety (65.4% vs 61.2%, p = 0.781). The main concern regarding changes in dosing practices included lack of pharmacist competency, which decreased after roll-out (48.7% vs 24.5%, p = 0.081). Before implementation respondents felt that practice problems and training sessions (69.2%) as well as clinical decision support (57.7%) were key to a successful roll-out. Satisfaction with implementation significantly increased in the post survey (26.9% vs 49.0%, p = 0.011).

**CONCLUSION:** Pharmacists were in support of a AUC-based pharmacist-to-dose strategy, but there were concern regarding competency. Training sessions with practice problems and integrated clinical decision support improved implementation.

**247E. A multicenter evaluation of pathogen distribution in culture positive patients admitted with skin and skin structure infection in the US** *Glenn Tillotson, Ph.D., FIDSA, FCCP*[1], Sue Cammarata, MD[2], John Murray, MPH[3], Vikas Gupta, Pharm.D., BCPS[3]; [1]GST Micro LLC, Durham, NC [2]Medical Affairs, Melinta Therapeutics, Inc., Lincolnshire, IL [3]Becton, Dickinson and Company, Franklin Lakes, NJ

Presented at the European Congress of Clinical Microbiology & Infectious Diseases, Madrid, Spain, April 21-24, 2018.

**248E. Demographics of culture positive patients in the admission period with skin and skin structure infection in the US: a multicenter evaluation of pathogen distribution** *Glenn Tillotson, Ph.D., FIDSA, FCCP*[1], Sue Cammarata, MD[2], John Murray, MPH[3], Stephen Kurtz, MS[3], Vikas Gupta, Pharm.D., BCPS[3]; [1]GST Micro LLC, Durham, NC [2]Medical Affairs, Melinta Therapeutics, Inc., Lincolnshire, IL [3]Becton, Dickinson and Company, Franklin Lakes, NJ

Presented at the European Congress of Clinical Microbiology & Infectious Diseases, Madrid, Spain, April 21-24, 2018.

**249. Clinical outcomes of urinary tract infections (uti) caused by klebsiella pneumoniae carbapenemase producing klebsiella pneumoniae (kpc-kp) following treatment with oral fosfomycin** *Faisal S. Minhaj, Pharm.D.*[1], Bryant Lai, Pharm.D.[2], Cely S. Abboud, MD[3], Gauri G. Rao, Pharm.D.[4]; [1]Department of Pharmacy Services, University of Rochester Medical Center, Strong Memorial Hospital, Rochester, NY [2]San Mateo, CA [3]Infection Control Department, Instituto Dante Pazzanese de Cardiologia, Sao Paulo, Brazil [4]Eshelman School of Pharmacy, University of North Carolina, Chapel HIll, NC

**INTRODUCTION:** Optimal treatment regimens for multi-drug resistant (MDR) pathogens like KPC producing organisms is not well defined. UTIs are often treated with oral antimicrobial therapy, however, KPC-KP is resistant to many classes of antibiotics, necessitating parenteral agents.

**RESEARCH QUESTION OR HYPOTHESIS:** Evaluate the clinical outcomes of KPC-KP UTIs treated with oral fosfomycin.

**STUDY DESIGN:** Retrospective cohort study.

**METHODS:** Descriptive analysis of adult inpatients on oral fosfomycin for PCR positive KPC-KP bacteriuria at Instituto Dante Pazzanese de Cardiologia, São Paulo, Brazil from August 2012 to May 2016.

**RESULTS:** Twenty-three patients met the inclusion criteria and were classified as having a KPC-KP UTI. Of these patients, twenty-one had outcome data available for analysis. The majority of the patients were female 14/21 (66.7%) with a median age of 67 (IQR 62–75 years). Successful clinical outcome was achieved in 13/21 (61.9%) patients. Fosfomycin dose used was 3g with a median frequency of 12 hours (IQR 12–24 hours). Duration of therapy was prolonged with a median duration of 7 days (IQR 5–8 days). Among the patients that failed therapy, 4/8 (50%) were obese while none of the 13 successful outcomes were obese. Analysis of the susceptibility profiles of infecting pathogens indicated that amikacin 21/23 (91%), colistin 16/20 (80%), and fosfomycin 16/18 (88.9%) were the only antibiotics with favorable susceptibility profiles (>75%) effective for the treatment of UTI.

**CONCLUSION:** Fosfomycin has demonstrated *in vitro* killing activity against KPC-KP urinary pathogens and clinical success when utilized to treat these infections. Fosfomycin was dosed more frequently and for a longer duration than the traditional one-time dose which may have led to its success rate of 61.9%. The high rate of obesity within the treatment failures suggest that these patients may be more difficult to treat. Given the lack of antimicrobial options, further research is needed in utilizing older antibiotics like fosfomycin with good activity against MDR KPC-KP.

**250E. Clinical experience with telavancin for the treatment of elderly patients (≥65 years): results from the Telavancin Observational Use Registry (TOUR)** Jeremy Storm, DO[1], John Pullman, MD[2], *Melinda Lacy, Pharm.D.*[3], Heidi Goldstein, MA[4], Bibiana Castaneda-Ruiz, MD[4]; [1]Rapid City, SD [2]Butte, MT [3]Medical Science Liaisons, Theravance Biopharma US, Inc, South San Francisco, CA [4]South San Francisco, CA

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**251. Improved methodology for determining y-site compatibility of vancomycin and piperacillin/tazobactam** Regan David, Pharm.D. Candidate[1], Brooke Clark, Pharm.D. Candidate[1], Quyen Ly, Pharm. D. Candidate[1], Callie Harris, BSN[2], Selah Wood, BSN[2], Jill Hightower, MSN, RN[2], *Elizabeth Covington, Pharm.D.*[1], Greg Gorman, Ph.D.[1]; [1]McWhorter School of Pharmacy, Samford University, Birmingham, AL [2]Ida Moffett School of Nursing, Samford University, Birmingham, AL

**INTRODUCTION:** Vancomycin and piperacillin/tazobactam are two commonly used antibiotics in hospitals. However, reported Y-site compatibility data is conflicting based on traditional simulated Y-site studies. To address the short-comings of this approach an improved experimental design using IV pumps and tubing to generate samples for physical and chemical compatibility was developed.

**RESEARCH QUESTION OR HYPOTHESIS:** Are clinically relevant concentrations of vancomycin and piperacillin/tazobactam physically and chemically compatible utilizing IV pumps and Y-site tubing?

**STUDY DESIGN:** Medications were prepared by pharmacy students while IV pumps were primed and operated by nursing students. Samples were collected as a function of various post Y-site tubing lengths to simulate clinical conditions and assayed by pharmacy students.

**METHODS:** IV fluid path and pump configuration had two primary lines with the Y-site located post pump. Three different dose combinations of vancomycin with piperacillin/tazobacatam were evaluated: (1) 4 mg/mL with 90 mg/mL, (2) 10 mg/mL with 22.5 mg/mL, and (3) 10 mg/mL with 90 mg/mL. Clinically relevant flow rates of 1 g/hr vancomycin and 12.5 ml/hr for piperacillin/tazobactam were used. Post Y-site samples were collected after medications flowed through different tubing lengths: 8, 22, 36, and 50 inches. Physical compatibility assessments included pH, turbidity, odor and visual inspection while chemical compatibility was determined using high performance liquid chromatography.

**RESULTS:** Vancomycin 4 mg/mL demonstrated physical and chemical compatibility with piperacillin 90 mg/mL at all tubing lengths as did vancomycin 10 mg/mL with piperacillin/tazobactam 22.5 mg/mL. Conversely, vancomycin 10 mg/mL with piperacillin/tazobactam 90 mg/mL were incompatible at all tubing lengths.

**CONCLUSION:** Vancomycin and piperacillin/tazobactam demonstrated Y-site compatibility using IV pumps and Y-site IV tubing at clinically used concentrations and dose rates. Additional research needs will determine the maximum compatible concentrations of these medications and potentially assess the impact of a variety of IV tubing products on physical and chemical compatibility.

**252. Implementation of a pharmacist-led antibiotic time-out intervention in an integrated health care system** *Calley M. Paulson, Pharm. D.*[1], Jillian Handley, Pharm.D.[2], Thomas J. Dilworth, Pharm.D., BCPS-AQ ID[2], Rachael Prusi, Pharm.D., MSGH[1], Sara Reeb, Pharm.D., MBA[1], Dan Persells, Pharm.D.[2], Charles F. Brummitt, MD[3], Riley Meyer, DO[4], Katherine M. Torres, DO[5], Lee Skrupky, Pharm.D., BCPS[6]; [1]Department of Pharmacy, Aurora BayCare Medical Center, Green Bay, WI [2]Department of Pharmacy, Aurora Saint Luke's Medical Center, Milwaukee, WI [3]Department of Infectious Diseases, Aurora Saint Luke's Medical Center, Milwaukee, WI [4]Department of Medicine, Aurora BayCare Medical Center, Green Bay, WI [5]Department of Infectious Diseases, Aurora Medical Group, Green Bay, WI [6]Department of Pharmacy, Mayo Clinic, Rochester, MN

**INTRODUCTION:** Antibiotic time-outs (ATO) are a recommended action for antimicrobial stewardship programs, but implementation is challenging and few studies have measured the impact.

**RESEARCH QUESTION OR HYPOTHESIS:** Implementing pharmacist-led ATOs will improve antibiotic therapy actions and documentation at 72 hours.

**STUDY DESIGN:** Quasi-experimental before-after study performed at two hospitals within a large health system.

**METHODS:** The ATO consisted of pharmacists communicating with the prescribing service regarding the antibiotic plan and completing electronic medical record (EMR) documentation by 72 hours. An EMR alert facilitated intervention completion and pharmacists and physicians received education. Inpatients assigned to hospitalist and intensivist services on selected units receiving broad-spectrum antibiotics for ≥ 72 hours were included. Patients with ID consults were excluded. The primary outcome was EMR documentation of an antibiotic plan satisfying all requirements. Secondary outcomes included measures of antibiotic utilization and antibiotic therapy actions by 72 hours.

**RESULTS:** 399 patients were included, 199 pre- and 200 post-intervention. The most common indications were pneumonia (32%), intra-abdominal infections (20%) and UTIs (19%), with no significant between-group differences. EMR documentation of an antibiotic plan significantly improved in the after phase (19% vs. 79%, p<0.0001) and significant differences in antibiotic therapy actions at 72 hours were observed (p<0.0001, see Table 1). The median duration of in-hospital antibiotic therapy was similar between groups (4.0 vs. 4.0 days, p=0.2499). Approximately 45% of patients in each group received discharge antibiotics and the median duration of therapy prescribed was reduced (7 vs. 5 days, p=0.0140).

**Table 1.** Antibiotic Therapy Actions at 72 hrs

| | PRE | POST |
|---|---|---|
| Escalation | 12.1% | 8.0% |
| De-escalation | 41.7% | 46.5% |
| Justified Continuation | 25.1% | 23.5% |
| Discontinuation | 10.1% | 8.0% |
| Defined Reassessment | 0% | 10.0% |
| No action | 11.1% | 4.0% |

**CONCLUSION:** Multi-site implementation of pharmacist-led ATOs was feasible and was associated with improvements in antibiotic therapy actions, supporting documentation, and duration of therapy at discharge.

**253E. Clinical experience with telavancin for the treatment of obese patients (BMI >30 kg/m$^2$): results from the Telavancin Observational Use Registry (TOUR)** Adnan Siddiqui, MD[1], Paul Santos, Pharm.D.[2], Suresh Antony, MD[3], *Candice Clay, Ph.D.*[4], Heidi Goldstein, MA[5], Bibiana Castaneda-Ruiz, MD[5]; [1]Bridgeton, MO [2]Laconia, NH [3]El Paso, TX [4]Theravance Biopharma US, Inc, South San Francisco, CA [5]South San Francisco, CA

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**254. Analysis of appropriate corticosteroid usage in the setting of suspected bacterial meningitis in patients at two community hospitals** *Mackenzie Poole, Pharm.D. Candidate 2019*[1], Brian Fox, Pharm.D., BCPS[2]; [1]Skaggs School of Pharmacy, University of Colorado, Aurora, CO [2]Medical Center of the Rockies, UCHealth, Loveland, CO

**INTRODUCTION:** Meningitis affects less than 1% of the population annually, however is associated with high rates of mortality and morbidity. In 2004, the IDSA published guidelines on the management of bacterial meningitis and made a recommendation in favor of dexamethasone usage based on clinical data.

**RESEARCH QUESTION OR HYPOTHESIS:** Use of dexamethasone prior to or with first dose of antibiotics in patients with suspected bacterial meningitis reduces morbidity and mortality with limited adverse effects at two community hospitals.

**STUDY DESIGN:** A retrospective chart review of patients presenting to community hospitals in northern Colorado with symptoms of bacterial meningitis from January 1st 2017 – December 31st 2017.

**METHODS:** All patients with a diagnosis of meningitis in the 2017 year were included. Primary outcome was the rate of appropriate dexamethasone use. Secondary outcomes included: adverse effects associated with dexamethasone use, appropriate antibiotic selection for age and indication, duration of antibiotic use, and mortality differences between those who received dexamethasone and those who did not.

**RESULTS:** A total of 27 patients were included in our chart review. 26% of patients received an appropriate dose of dexamethasone at an appropriate time. No major adverse effects associated with dexamethasone were identified. Two of the 27 (7.4%) patients did not receive appropriate empiric antibiotic therapy based on age. No significant difference between duration of antibiotic use (p=0.44) or morality (p=0.29) was seen between patients who received dexamethasone and those who did not.

**CONCLUSION:** The use of corticosteroids in the setting of possible bacterial meningitis has low risks for adverse side effects. A morbidity and mortality benefit was not seen in this chart review; however, it did demonstrate that dexamethasone use in the setting of meningitis is not being optimized at our community hospitals. We believe that further investigation into how pharmacy can impact appropriate patient selection for corticosteroid use is warranted.

**255. Direct acting antiviral treatment of hepatitis c virus in elderly patients** Christine Mauriello, Pharm.D. Candidate[1], *Derek Peiffer, Pharm.D. Candidate*[1], Jennifer Andres, Pharm.D.[2]; [1]School of Pharmacy, Temple University, Philadelphia, PA [2]Department of Pharmacy Practice, Temple University School of Pharmacy, Philadelphia, PA

**INTRODUCTION:** Hepatitis C Virus (HCV) is a prevalent virus that causes hepatic damage. Minimal research has been done on HCV treatments with direct-acting antivirals (DAAs) in the elderly population, which includes many "baby boomers." The "baby boomer" population has a high rate of HCV, many of whom have been living with HCV for years leading to liver and other organ dysfunction. Elderly patients are also likely to be on more medications, possibly affecting adherence and outcomes. It is vital to determine if treatment outcomes differ in the elderly population.

**RESEARCH QUESTION OR HYPOTHESIS:** Does pill burden, comorbidities, or fibrosis staging cause differences in achieving Sustained Virologic Response at 12 weeks (SVR12) in HCV infected patients >70 years old?

**STUDY DESIGN:** This was a retrospective chart review.

**METHODS:** Medical records were reviewed using the EPIC electronic medical record system. Data was collected for number of daily medications, number of pills taken daily, number of as needed medications, and number of as needed pills taken per day. Information was collected on the presence of patient's comorbidities including diabetes, cardiovascular disease, cognitive impairment, B-cell non-Hodgkin's lymphoma, and kidney function (eGFR). Information was also collected on fibrosis staging.

**RESULTS:** Charts of 62 patients were reviewed, and overall SVR12 was 79%. Those who achieved SVR12 had an average pill per day count of 9.43, while those who did not achieve SVR12 averaged 8.54. Patients who did not achieve SVR12 had higher rates of cognitive impairment and diabetes. Of patients not achieving SVR12, 61.5% had a fibrosis stage of F4. Fibrosure and FibroTest were the most common methods of assessing fibrosis stage.

**CONCLUSION:** There is no apparent effect of pill burden on achieving SVR12 in this elderly population. It seems that cognitive impairment, diabetes, and high fibrosis score may be factors leading to non-achieved SVR12.

**256. Beta-lactam antibiotics alter the il-1β and il-10 response in patients with staphylococcus aureus bacteremia (sab)** *Cecilia Volk, BA*[1], Graham Edwardson, BS[1], Victor Nizet, MD[2], George Sakoulas, MD[2], Warren Rose, Pharm.D.[1]; [1]School of Pharmacy, University of Wisconsin-Madison, Madison, WI [2]Department of Pediatrics and School of Pharmacy & Pharmaceutical Sciences, University of California- San Diego, La Jolla, CA

**INTRODUCTION:** The innate immune response during SaB is poorly understood. Elevated IL-1β or IL-10 at patient presentation are recent biomarkers for bacteremia duration and mortality. This suggests a major role of the host response for infection outcome.

**RESEARCH QUESTION OR HYPOTHESIS:** We hypothesized that antibiotics differentially modulate IL-1β and IL-10 during SaB treatment.

**STUDY DESIGN:** I*n vitro* analysis of prospectively collected patient samples

**METHODS:** Fifty-nine patients with diverse sources of SaB were evaluated (47 MRSA, 12 MSSA). In the first 48 hours, patients were treated with either 1) β-lactams (n=24), including oxacillin, cefazolin, or ceftaroline, or 2) glyco/lipopeptide (n=35), including vancomycin or daptomycin (VAN/DAP). Patient sera were obtained on day 1 of hospital presentation and then days 3 and 7. IL-1β and IL-10 were quantified by ELISA and compared between the two treatment groups using Mann-Whitney U.

**RESULTS:** Patients had similar IL-1β at presentation prior to receiving an antibiotic (median 6.1 vs. 2.8 pg/mL for β-lactam and VAN/DAP, respectively, P=0.090). Those treated with a β-lactam had significantly higher IL-1β on day 3 (median 7.54 vs. 1.9 pg/mL for VAN/DAP; P=0.007) and day 7 (12.52 vs. 1.56 pg/mL for VAN/DAP; P=0.016).

Importantly, β-lactam treatment resulted in 23% and 105% increase in IL-1β at days 3 and 7, while VAN/DAP resulted in 32% and 44% reduction, respectively. IL-10 was similar at presentation (median 17.64 pg/mL for β-lactam and 10.5 pg/ml for VAN/DAP; P=0.133). Both groups had IL-10 reductions by day 3 (7.0 vs 8.8 pg/ml; P=0.745) and day 7 (2.5 pg/mL vs. 6 pg/mL; P=0.864).

**CONCLUSION:** Since inflammasome activation is essential for infection clearance, increases noted in IL-1β have important therapeutic implications. β-lactams even in MRSA may be beneficial in decreasing SaB duration and complications. A therapeutic regimen of VAN or DAP combined with a β-lactam for MRSA is suggested based on these results.

**257. Case series of adjunctive fibrinolytics to aid in intra-abdominal abscess drainage** *Amanda Van Matre, Master of Science*[1], Meghan Jeffres, Pharm.D.[2]; [1]Skaggs School of Pharmacy and Pharmaceutical Sciences, University of Colorado, Aurora, CO [2]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy, Aurora, CO

**INTRODUCTION:** Fibrinolytics are used to facilitate drainage of intrapleural effusions; however, very little is known about the safety or efficacy of fibrinolytics to assist in the drainage of intra-abdominal abscesses.

**RESEARCH QUESTION OR HYPOTHESIS:** Is the use of intracavitary alteplase associated with systemic bleeding or an increased drain output from intra-abdominal abscesses?

**STUDY DESIGN:** Case series

**METHODS:** The patient cohort was identified through a multi-site electronic health record database. Eligibility was based on receipt of a fibrinolytic into an abdominal abscess following drain placement in patients at least 18 years of age. Primary outcome measures included change in hemoglobin, drain output, and surgical intervention.

**RESULTS:** Twenty-two abscesses from 15 patients met inclusion criteria. The median age was 51 years (IQR 42-64). Abscesses were located in the peritoneal cavity (n=18), liver (n=2), and pancreas (n=2). Pathogens were cultured from 18 abscesses, 15 of which were polymicrobial. All patient received alteplase through the abscess drain. The most common dose was 5 mg with a dwell time of 1 hour (range 1-4 hours). Median baseline 24-hour drain output was 20 mL (IQR 8-46). Median output after first alteplase instillation was 56 mL (IQR 30-165). Consecutive median drain output was 75 mL (IQR 38-157) following second instillation (n=15), 145 mL (IQR 69-200) after third instillation (n=9), and 129 mL (IQR 61-270) after fourth instillation (n=6). Median decrease in hemoglobin after first, second, third, and fourth alteplase instillations was 0 g/dL (IQR 0-1), 0.3 g/dL (IQR 0-1.2), 1.1 g/dL (IQR 0-1.3), and 0 g/dL, respectively. One patient received two blood transfusions. Six abscesses (27%) required surgical intervention.

**CONCLUSION:** The use of intracavitary alteplase is an effective method for stimulating intra-abdominal abscess drainage without meaningful decreases in hemoglobin. Abscess drainage increased with repeat instillations up to the third instillation of alteplase.

**258. Evaluation of statin therapy on outcomes of streptococcal species bacteremia** *Jaimie Chen, BS*[1], Cynthia Bor, BS[1], Michelle Gandawidjaja, B.A.[1], Amy Kang, Pharm.D.[1], Emi Minejima, Pharm.D.[2]; [1]School of Pharmacy, University of Southern California, Los Angeles, CA [2]USC School of Pharmacy, Los Angeles, CA

**INTRODUCTION:** Statins have pleiotropic effects including anti-inflammatory effects. Prior studies have found a mortality benefit with adjunctive statin therapy in *S. aureus* bloodstream infection (BSI); however, outcomes in streptococcal BSI have not been evaluated.

**RESEARCH QUESTION OR HYPOTHESIS:** Patients with streptococcal BSI treated with statin therapy in addition to antibiotic therapy have improved survival.

**STUDY DESIGN:** Retrospective cohort study

**METHODS:** Adult hospitalized patients with streptococcal BSI who were admitted between Jun 2015 – Oct 2017 were included. Exclusions include: <48h of antibiotic therapy or therapy started >48h from first positive culture. Patients were grouped by receipt of statin (S group) vs no statin (NS group) and compared for demographics, clinical course, and outcomes. Medical charts were reviewed for pertinent data. The primary outcome was 30d mortality. The secondary outcomes included ICU admission, duration of bacteremia, and length of hospital stay (LOS).

**RESULTS:** 344 patients met inclusion criteria; median age was 51yo, 68% were male, 57% were Hispanic, and 71% had community-onset BSI. The S group (13%) had higher prevalence of diabetes (S 59% vs NS 21%, p<0.0001), renal disease (S 18.2% vs NS 7.0%, p=0.020), and CHF (21% vs 4%, p=0.0004), while the NS group had higher prevalence of liver disease (S 7% vs NS 20%, p=0.037). Viridans strep. was the most common pathogen identified (27%). Clinical presentation was similar between the groups with median SOFA scores of S 6 (IQR 5, 8) vs NS 4 (IQR 3, 8), p=0.081. 30d mortality rate (S 5% vs NS 10%, p=0.40), ICU admission (S 45% vs NS 40%, p=0.40), duration of bacteremia (S 2d [IQR 1, 2] vs NS 2d [IQR 1, 3], p=0.58), LOS (S 9d [IQR 6, 18] vs NS 7d [IQR 5, 14], p=0.11) were also similar between the two.

**CONCLUSION:** In patients infected with streptococcal BSI, statin therapy did not affect the severity of clinical presentation or outcomes.

**259. Pharmacist-driven procalcitonin-guided algorithm for antibiotic use in ICU patients with pneumonia** *Ariel Ferdock, Pharm.D.*[1], Ronald Campbell, Pharm.D., BCPS[2], Frank D'Amico, Ph.D.[3], Aaron Pickering, Pharm.D., BCPS[2]; [1]UPMC St. Margaret, Pittsburgh, PA [2]Department of Pharmacy, UPMC – St. Margaret, Pittsburgh, PA [3]Department of Biostatistics, UPMC St. Margaret, Pittsburgh, PA

**INTRODUCTION:** Antibiotic use in non-bacterial respiratory tract infections leads to unnecessary antibiotic exposure and potential medication side effects. Ordering a procalcitonin (PCT) laboratory test and following a specific algorithm may decrease this occurrence. Currently, PCT can be ordered for patients with pneumonia; however, within many institutions there is not a standardized algorithm to help guide the physicians in regard to antibiotic use.

**RESEARCH QUESTION OR HYPOTHESIS:** Will implementing a standardized PCT algorithm increase the rate of PCT utilization?
**STUDY DESIGN:** Retrospective chart review
**METHODS:** Patients were identified by a monthly report using ICD-10 codes for pneumonia. Adult ICU patients with pneumonia were included. Patients were excluded if they had septic shock, confirmed fungal infection, or a current tumor. A chart audit was performed to collect baseline data and PCT values pre-and post-implementation. Baseline data was collected from August 2017 – January 2018. A PCT algorithm was implemented in February 2018; education provided by a clinical pharmacist. Post-implementation data was collected from March 2018 – May 2018. The primary outcomes were rate of PCT ordered and rate PCT algorithm applied appropriately. Descriptive statistics were used to describe pre-and post-groups.
**RESULTS:** The pre-implementation group from August 2017 – January 2018 included 100 patients. PCT was ordered in 70% [95%CI: 0.59,0.78] of patients. These PCT values were hypothetically applied to the algorithm, and 70% [95%CI: 0.57,0.80] received appropriate treatment regarding antibiotics. Mean antibiotic duration was 6.2 days ±2.5. Post-implementation data consisted of 31 patients. PCT was ordered in 90% [95%CI: 0.74,0.98] of patients. Of the patients with PCT ordered, the PCT algorithm was applied appropriately 96% [95% CI: 0.82,0.99]. Mean antibiotic duration 5.5 days ±2.8.
**CONCLUSION:** Implementing a standardized PCT algorithm, with a pharmacist's guidance, increased PCT utilization, appropriateness of use, and judicious use of antibiotics in ICU patients.

**260. Outcomes of inappropriate empiric antibiotic therapy (iet) in patients hospitalized with skin and skin structure infections receiving appropriate definitive therapy (adt): a multicenter study** *Glenn Tillotson, Ph.D., FIDSA, FCCP*[1], Sue Cammarata, MD[2], Stephen Brossette, MD, Ph.D.[3], Vikas Gupta, Pharm.D., BCPS[3], Ning Zheng, Ph.D.[3]; [1]GST Micro LLC, Durham, NC [2]Medical Affairs, Melinta Therapeutics, Inc., Lincolnshire, IL [3]Becton, Dickinson and Company, Franklin Lakes, NJ
**INTRODUCTION:** Acute bacterial skin infections account for >12 million infections annually in the US. The impact of IET on total hospital cost and length of stay (LOS) in patients that received ADT was analyzed.
**RESEARCH QUESTION OR HYPOTHESIS:** Admissions prescribed IET have higher adjusted hospital cost and LOS than those prescribed appropriate therapy.
**STUDY DESIGN:** We used large log-level and negative binomial regression models to estimate the effects of IET on total hospital costs and LOS, respectively in SSSI from 68 acute care hospitals in 2015-2017 in the BD Insights Research Database (Franklin Lakes, NJ).
**METHODS:** Cost and LOS effects of IET for first positive skin/wound cultures in patients discharged with a primary or secondary ICD10 code for SSSI. IET defined as therapy up to 5 days prior to final culture results that did not include at least one antibiotic that covered. The models include physician and hospital fixed effects in addition to covariates for acute severity of illness (SOI), ICD10 diagnoses and procedures, patient demographics, and prior exposure to healthcare.
**RESULTS:** 8,113 SSSI admissions and first culture positive empiric and definitive treatments were identified. Estimated cost and LOS effects of IET are proportional and range from about 15-30%. Average marginal costs and LOS were significantly higher in patients that received IET (* $p < .05$ for all).

| Category | Marginal Cost* | Marginal LOS (days)* |
|---|---|---|
| Overall | $2,578 | 1.52 |
| Gram Negative (mono, poly or mixed) | $3,725 | 1.93 |
| Gram Positive only | $1,954 | 1.24 |
| *Mixed GN/GP (~50% of all SSSI with IET)* | $3,128 | 1.78 |
| *Mono GN (~15% of all SSSI with IET)* | $3,320 | 1.87 |
| *Mono GP* | $2,452 | 1.47 |
| *Poly GN* | $6,521 | 3.82 |
| *Poly GP* | $1,160 | 0.7 |
| *3+ strains* | $2,578 | N/A |

**CONCLUSION:** Overall IET in SSSI that receive appropriate definitive therapy is associated with significantly higher costs and LOS. Infection with a Gram-negative pathogen impacts these costs significantly.

**261. Changing microbiology in hospitalized patients with culture positive community acquired pneumonia (cap) treated with empiric antibiotic therapy: a multicenter evaluation** *Glenn Tillotson, Ph.D., FIDSA, FCCP*[1], Sue Cammarata, MD[2], John Murray, MPH[3], Vikas Gupta, Pharm.D., BCPS[3]; [1]GST Micro LLC, Durham, NC [2]Medical Affairs, Melinta Therapeutics, Inc., Lincolnshire, IL [3]Becton, Dickinson and Company, Franklin Lakes, NJ
**INTRODUCTION:** CAP is reported in >5 million patients in US annually with 20-25% being hospitalized with empiric antibiotic therapy.
**RESEARCH QUESTION OR HYPOTHESIS:** To evaluate the pathogen distribution in patients hospitalized with culture positive CAP.
**STUDY DESIGN:** This was a retrospective observational study across 68 acute care facilities nation-wide, 2015-2017, in the BD Insights Research Database (Franklin Lakes, NJ).
**METHODS:** First positive bacterial respiratory pathogens for patients discharged with a primary or secondary ICD10 code for CAP was analyzed. Gram-negative (GN), Gram-positive (GP) and atypical pathogens were included if collected within 3 days of admission and were further categorized as healthcare associated (HCA). Routine cultures, antigenic and serologic tests were performed as appropriate.
**RESULTS:** 3,167 (11.7%) of 27,136 admissions had a respiratory pathogen identified within 3 days of admission and received empiric antimicrobial therapy. Of culture positive admissions, 56.2% were identified in the ICU and 34% were identified as HCA. *P. aeruginosa* (19.7%), MRSA (19.4%), MSSA (15.2%), *S. pneumoniae* (15.0%), and *H. influenzae* (8.4%) were the top 5 pathogens that were identified in 77.7% of 3,167 admissions see table. 21.9 % were polymicrobial.

| Pathogen | Non-HCA (n, %) | HCA (n, %) | Total (n, %) |
|---|---|---|---|
| *P. aeruginosa* | 387 (18.5%) | 238 (22.1%) | 625 (19.7%) |
| MRSA | 378 (18.1%) | 235 (21.8%) | 613 (19.4%) |
| MSSA | 330 (15.8%) | 152 (14.2%) | 482 (15.2%) |
| *S. pneumoniae* | 349 (16.7%) | 127 (11.8%) | 476 (15.0%) |
| *H. influenzae* | 193 (9.2%) | 74 (6.9%) | 267 (8.4%) |
| *E. coli* | 130 (6.2%) | 78 (7.2%) | 208 (6.6%) |
| *K. pneumoniae* | 126 (6.0%) | 66 (6.1%) | 192 (6.1%) |
| *M. pneumoniae* | 74 (3.5%) | 32 (3.0%) | 106 (3.3%) |
| Other | 379 (18.1%) | 215 (20.0%) | 594 (18.8%) |
| **Total** | **2,091 (66.0%)** | **1,076 (34.0%)** | **3,167** |

**CONCLUSION:** The bacterial etiology of patients admitted with CAP is changing with 7 out of 10 pathogen positive admissions due to *S. aureus* or Gram-negatives. Additionally, the origin of CAP should be taken into account.

**262. A urinary tract infection treatment protocol to change prescribing practices in the long-term care facility of a veteran's healthcare system** *Spencer Durham, Pharm.D. BCPS (AQ-ID)*[1], Addison Ragan, Pharm.D.[2]; [1]Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Auburn, AL [2]Pharmacy, Central Alabama Veterans Health Care System, Montgomery, AL

**INTRODUCTION:** Antimicrobial therapy is commonly prescribed for urinary tract infections (UTIs) in long-term care facilities (LTCFs), but are often unnecessary or incorrectly prescribed. At the LTCF of the Central Alabama Veterans Health Care System (CAVHCS), resistance to antimicrobials commonly used for UTIs has been dramatically increasing. On the 2017 institutional LTCF antibiogram, *Escherichia coli* demonstrated only forty-five percent and eighteen percent susceptibility to trimethoprim/sulfamethoxazole and ciprofloxacin/levofloxacin, respectively. Despite this high resistance, trimethoprim/sulfamethoxazole and fluoroquinolones are still the most commonly prescribed empiric UTI therapy at the LTCF.

**RESEARCH QUESTION OR HYPOTHESIS:** Does the implementation of a standard treatment protocol for urinary tract infections change clinician prescribing practices and decrease the use of inappropriate empiric antimicrobial therapy for the treatment of UTIs at the CAVHCS LTCF?

**STUDY DESIGN:** Prospective, observational

**METHODS:** The pharmacy department developed a UTI treatment protocol with the input of prescribers in the LTCF. The protocol emphasized correct UTI diagnosis through urinalysis and urine cultures as a means of decreasing unnecessary antimicrobial prescribing. Based on the LTCF antibiogram, nitrofurantoin is recommended as an empiric first-line agent for most patients, with cefpodoxime/ceftriaxone reserved for patients with renal dysfunction or systemic infections.

**RESULTS:** Eight months of data was analyzed, with 70 patients included. Ciprofloxacin was not prescribed for any patient, and levofloxacin was prescribed in only two patients (3%), both of whom also had pneumonia. Trimethoprim/sulfamethoxazole was prescribed in 6 patients (8.5%), but use was deemed appropriate in two cases based on patient specific factors. All other patients received nitrofurantoin (21.5%), cefpodoxime (54%), or ceftriaxone (13%). In addition, 62 patients (88.6%) had urinalyses obtained, and 58 patients (83%), had urine cultures obtained. The results of this preliminary analysis indicate that the treatment protocol is largely being followed.

**CONCLUSION:** The implementation of a UTI treatment protocol was effective in changing prescribing practices and decreasing the use of inappropriate antimicrobials at the LTCF.

**263. Treatment failure rates in patients receiving low versus high oral bioavailability antibiotics for gram-negative bacteremia** *Ryan Gumbleton, Pharm.D.*[1], Jennifer Ott, Pharm.D.., BCPS[2], Melanie Townsend, Pharm.D., BCPS[3], Camilla Reese, MD., FACP[4]; [1]Pharmacy Department, Billings Clinic, Billings, MT [2]Pharmacy, Billings Clinic, Billings, MT [3]Billings Clinic, Billings, MT [4]Infectious Diseases, Billings Clinic, Billings Clinic, MT

**INTRODUCTION:** Gram-negative bacteremia (GNB) is associated with high rates of morbidity and mortality. High bioavailability antibiotics (HBAs) are standard treatment for GNB, but their popularity has decreased due to resistance rates and potential adverse effects. Low bioavailability antibiotics (LBAs) may be effective alternatives; however, their use is controversial due to potentially decreased concentrations at infection sites.

**RESEARCH QUESTION OR HYPOTHESIS:** LBAs are non-inferior to HBAs in the definitive treatment of Enterobacteriaceae bacteremia.

**STUDY DESIGN:** Single-center, retrospective, cohort study.

**METHODS:** Adults with bacteremia caused by *Escherichia coli*, *Proteus mirabilis*, and *Klebsiella pneumoniae* who received step-down oral therapy as definitive treatment for at least 2 days were included. Groups were divided based on the oral bioavailability of the antibiotic. The primary outcome was treatment failure, defined as hospital readmission due to the same infection source or bacteria or a change in antibiotic treatment within 30 days despite adequate dosing of a study antibiotic. Secondary outcomes included 30-day all-cause mortality, therapy duration, and hospital and intensive care unit (ICU) lengths of stay (LOS). For the primary outcome, a noninferiority test on the risk difference between the two arms was performed with a -10% margin using the Farrington-Manning test.

**RESULTS:** Of 500 patients screened, 215 were included, 91 in the LBA group and 124 in the HBA group. The most common cause of GNB was *E. coli* due to a urinary source. For treatment failure, a 1.2% risk difference was observed (95% CI -6.1% to 8.5%), excluding the noninferiority margin. No differences were found in 30-day all-cause mortality, antibiotic duration, hospital LOS, or ICU LOS. Stratification by subject weight yielded no differences between groups.

**CONCLUSION:** Treatment failure rates were similar when using low versus high bioavailability oral antibiotics as definitive therapy in patients with GNB. Mortality rates, therapy duration, and lengths of stay were similar between groups.

**264E. Impact of educational interventions on antibiotic prescribing for acute upper respiratory tract infections in the ambulatory care setting** *Kaitlyn Craddock, Pharm.D.*[1], Suzanne Molino, Pharm.D.[2], Paul Stranges, Pharm.D.[3], Katie Suda, Pharm.D., MS[1], Thomas Kannampallil, Ph.D.[4], Jonathan Radosta, MD[5], John Hickner, MD[6], Nancy Shapiro, Pharm.D.[1], Susan C Bleasdale, MD[7], Alan Gross, Pharm.D.[3]; [1]Department of Pharmacy Practice, University of Illinois at Chicago College of Pharmacy, Chicago, IL [2]Department of Pharmacy Practice, Rosalind Franklin University of Medicine and Sciences, North Chicago, IL [3]University of Illinois at Chicago College of Pharmacy, Chicago, IL [4]Department of Family Medicine, University of Illinois at Chicago, Chicago, IL [5]University of Illinois Hospitals and Health Sciences System, Chicago, IL [6]University of Illinois Hospital and Health Sciences System, Chicago, IL [7]Section of Infectious Disease, University of Illinois at Chicago, Chicago, IL

Presented at IDWeek 2018, San Francisco, CA, October 3-7, 2018.

**265. Discovery and characterization of a novel mechanism of clinical triazole antifungal resistance; mutations in the aspergillus fumigatus HMG-CoA reductase gene, HMG1** *Jeffrey Rybak, Pharm.D.*[1], Nathan P. Wiederhold, Pharm.D.[2], Jarrod R. Fortwendel, Ph.D.[3], P. David Rogers, Pharm.D., Ph.D.[1]; [1]University of Tennessee College of Pharmacy, Memphis, TN [2]Fungus Testing Laboratory, UT Health Science Center at San Antonio, San Antonio, TX [3]Department of Clinical Pharmacy, University of Tennessee, Memphis, TN

**INTRODUCTION:** *Aspergillus fumigatus* is the predominant pathogen of invasive aspergillosis, a disease state associated with more than 200,000 life-threatening infections annually. The triazole antifungals, which inhibit ergosterol biosynthesis, are relied upon as both frontline and salvage therapies for the treatment of aspergillosis. However, triazole resistance among clinical isolates of *A. fumigatus* is increasingly encountered worldwide, a large proportion of which remains unexplained.

**RESEARCH QUESTION OR HYPOTHESIS:** Mutations in the *A. fumigatus* HMG-CoA reductase gene, *hmg1*, directly contribute to clinical triazole resistance.

**STUDY DESIGN:** In-*vitro* analysis of clinical *A. fumigatus* isolates.

**METHODS:** Whole genome sequencing was performed on 21 triazole-resistant clinical isolates and 5 susceptible control isolates from the United States. Mutations in *hmg1* unique to resistant isolates were identified. CRISPR-Cas9-mediated transformations were utilized to introduce mutant *hmg1* alleles into a triazole-susceptible control isolate, and to correct *hmg1* mutations found in triazole-resistant clinical isolates. Minimum inhibitory concentrations (MIC) for voriconazole, itraconazole, and posaconazole were determined for all isolates.

**RESULTS:** Whole genome sequencing analysis revealed *hmg1* mutations unique to triazole-resistant isolates in 11 of the 21 resistant isolates (54%) in this collection. Introduction of 3 different individual *hmg1* mutations (encoding F262del, S305P, and I412S amino acid substitutions) into a triazole-susceptible control isolate resulted in a 4 to 8-fold increase in voriconazole, itraconazole, and posaconazole MIC in all cases. Correction of *hmg1* mutations to the wild-type sequence in 3 individual resistant clinical isolates led to a decrease in itraconazole or posaconazole MIC in all cases.

**CONCLUSION:** These data demonstrate for the first time that mutations in the *A. fumigatus* HMG-CoA reductase gene, *hmg1*, are common among triazole-resistant clinical isolates, and that these mutations directly contribute to clinical triazole resistance. Further research is needed to evaluate potential therapeutic strategies, such as pharmacologic inhibition of Hmg1, to overcome triazole resistance mediated by this novel resistance mechanism.

**266E. Pathogen type and inappropriate empiric therapy (IET) in culture-positive skin and soft tissue infection among hospitalized patients in the U.S., 2015-2017** *Glenn Tillotson, Ph.D., FIDSA, FCCP*[1], Sue Cammarata, MD[2], Marya Zilerberg, MD, MPH[3], John Murray, MPH[4], Gang Ye, Ph.D.[5], Vikas Gupta, Pharm.D., BCPS[4]; [1]GST Micro LLC, Durham, NC [2]Medical Affairs, Melinta Therapeutics, Inc., Lincolnshire, IL [3]EviMed, Dreieich, Germany [4]Becton, Dickinson and Company, Franklin Lakes, NJ [5]Becton, Dickinson & Co., Franklin Lakes, NJ

Presented at the American Society of Microbiology, Atlanta, Georgia, June 7-11, 2018.

**267E. Microbiology of culture-positive skin and skin structure infection among hospitalized patients in the U.S., 2015-2017** *Glenn Tillotson, Ph.D., FIDSA, FCCP*[1], Sue Cammarata, MD[2], Marya Zilerberg, MD, MPH[3], John Murray, MPH[4], Vikas Gupta, Pharm.D., BCPS[4]; [1]GST Micro LLC, Durham, NC [2]Medical Affairs, Melinta Therapeutics, Inc., Lincolnshire, IL [3]EviMed, Dreieich, Germany [4]Becton, Dickinson and Company, Franklin Lakes, NJ

Presented at American Society of Microbiology, Atlanta, June 7-11, 2018

**268E. Evaluating proper empiric therapy for acute uncomplicated cystitis in the outpatient setting in the face of multidrug resistance** *Kayla Natali, Pharm.D.*[1], Steven Nerenberg, Pharm.D.[2], Dorothy McCoy, Pharm.D., BCPS-AQ ID[2]; [1]St. Joseph's University Medical Center, Paterson, NJ [2]Department of Pharmacy, St. Joseph's University Medical Center, Paterson, NJ

Presented at the New Jersey Society of Health System Pharmacists Annual Meeting, Long Branch, NJ, April 13, 2018

**269. Adverse outcomes related to fluoroquionolone use in patients with urinary tract infection** *Sing Ping Chow, BS*[1], Timothy Murrey, Pharm.D.[2], Marianne Pop, Pharm.D., BCPS[3], Julie B. Giddens, Pharm. D., BCPS[4], Kevin Rynn, Pharm.D., FCCP, DABAT[3], Alyssa Christensen, Pharm.D.[3]; [1]University of Illinois at Chicago, Rockford, IL [2]Department of Pharmacy, OSF St. Anthony Medical Center, Rockford, IL [3]Department of Pharmacy Practice, The University of Illinois College of Pharmacy, Rockford, IL [4]OSF Saint Francis Medical Center, Peoria, IL

**INTRODUCTION:** The FDA issued an updated warning on the use of fluoroquinolones, the risk of using flouroquinolones outweighs the benefits in treating uncomplicated urinary tract infections (UTIs). In this study, the adverse outcomes associated with fluoroquinolones were assessed in patients receiving antibiotics for UTIs.

**RESEARCH QUESTION OR HYPOTHESIS:** Are more adverse outcomes associated with fluoroquinolone use compared to alternative antibiotics in the treatment of UTIs?

**STUDY DESIGN:** Multicentered, retrospective study.

**METHODS:** Patients were included in the fluoroquinolone group if more than 50% of their drug therapy was comprised of with ciprofloxacin or levofloxacin. Patients were included in the alternative antibiotic group if their drug regimen included a fluoroquinolone less than 50% of the treatment duration. Patients were excluded if they were pregnant, undergoing a urologic procedure, had a kidney transplant, or received a combination of antibiotics where no particular antibiotic exceeded 50% of the total length of therapy. The primary outcome was a composite outcome including 30-day readmission, development of *C. difficile* infection or a multi-drug resistant (MDR) infection within 6 months. Secondary outcomes included treatment failure, 90-day representation to the emergency department, hospital, or clinic, length of hospital stay, all-cause mortality, and intensive care unit admission.

**RESULTS:** 664 patients were screened. 433 patients were excluded. 231 patients were included in the final analysis. 48 patients were included in the fluoroquinolone group and 183 patients in the alternative group. Demographic data were well balanced; although, more patients in the fluoroquinolone group had a history of an ESBL infection (10.4% vs 2.1%, p=0.02) and sulfa allergies (33.3% vs 17.1% p=0.02). There was no statistical difference in the primary outcome between the alternative and fluoroquinolone groups (23.0% vs 37.5%, p=0.06). There was no statistical difference between groups with regards to secondary outcomes.

**CONCLUSION:** Although not statistically significant, fluoroquinolone use was associated with a trend towards increased adverse outcomes in the treatment of UTIs.

**270. Ceftolozane-tazobactam use and outcomes at an academic transplant center** Molly Henry, Pharm.D.[1], John Schoen, Pharm.D.[1], Laura Puzniak, Ph.D.[2], Janet Raddatz, Pharm.D.[2], Trevor Van Schooneveld, MD, FACP[3], *Scott J. Bergman, Pharm.D., FCCP, FIDSA, BCPS*[1]; [1]Department of Pharmaceutical and Nutrition Care, Nebraska Medicine, Omaha, NE [2]Merck & Co., Inc, Kenilworth, NJ [3]Division of Infectious Diseases, University of Nebraska Medical Center, Omaha, NE

**INTRODUCTION:** Transplant recipients are at high risk for Gram-negative infections. Ceftolozane/tazobactam is a potent new anti-pseudomonal agent with broad Gram-negative activity, but description of its use in immunocompromised patients is limited.

**RESEARCH QUESTION OR HYPOTHESIS:** Describe use of ceftolozane/tazobactam, including in solid organ transplant patients

**STUDY DESIGN:** Retrospective cohort

**METHODS:** Adult patients receiving > 24 hours of ceftolozane/tazobactam from 5/15-8/17 were included. Characteristics and outcomes were described for all, including a subset with solid organ transplant (SOT). Our stewardship program recommends ceftolozane/tazobactam only for patients with a history or current multidrug resistant infection. Clinical success was the absence of pre-treatment signs/symptoms and/or no escalated antibiotic treatment needed within 48 hours of completing ceftolozane/tazobactam therapy.

**RESULTS:** 29 patients received 42 ceftolozane/tazobactam courses, median 10 days duration (range 2, 85). Ceftolozane/tazobactam was used empirically in 15 courses and de-escalated for 7. It was monotherapy for 13 courses. The median dose was 1500mg (range 150, 3000) every 8 hours. Doses were adjusted for renal dysfunction including hemodialysis (n=10) and continuous renal replacement therapy (n=8). 51% were in ICU during treatment. The most common indications were pneumonia (26%), bacteremia (14%), and UTIs (14%). The most frequent organism was *Pseudomonas aeruginosa* (75%). Two isolates were not susceptible to ceftolozane/tazobactam and therapy was switched. Infectious diseases was consulted in all. Ceftolozane/tazobactam was used successfully in 76% of courses and 30-day mortality was 38%. 11 SOT recipients accounted for 20 (48%) courses with 60% success. Their 30-day mortality rate was 36%. The median time from transplant to ceftolozane/tazobactam was 1 year (IQR 1,10).

**CONCLUSION:** Much of the ceftolozane/tazobactam use at our institution is for SOT recipients and the rest for critically ill patients. Despite the complexity of these patients, clinical success was seen for the majority. Further study of ceftolozane/tazobactam among these subpopulations is warranted to further elucidate these findings and compare results to other treatment regimens.

**271. Risk of catheter-related bloodstream infections in pulmonary hypertension patients receiving continuous IV prostacyclins** *Jenna Yager, Doctor of Pharmacy*, Jamal Jamil, Doctor of Pharmacy and Matthew Casciano, Doctor of Pharmacy; UCHealth, Aurora, CO

**INTRODUCTION:** Intravenous (IV) prostacyclins have improved outcomes in patients with pulmonary hypertension (PAH). Patients receiving continuous IV medications have an increased risk of bloodstream infections (BSIs). Prostacyclin infusion cassettes are prepared by patients in the absence of a sterile compounding environment, contributing to the increased infection risk. An increased incidence of gram-negative BSIs have previously been seen in these patients.

**RESEARCH QUESTION OR HYPOTHESIS:** We hypothesize the incidence of BSIs among IV treprostinil recipients to be greater than epoprostenol recipients and a greater rate of gram-negative than gram-positive infections.

**STUDY DESIGN:** This is a restrospective cohort study of inpatients at University of Colorado Hospital from 2012–2017. Included patients were ≥18 years, diagnosed with PAH, and receiving continuous IV epoprostenol or treprostinil. Patients receiving prostacyclins via nebulization or subcutaneous infusion, or with a previous admission within 90 days were excluded.

**METHODS:** The primary outcome is incidence of BSI in four cohorts of patients receiving IV prostacyclins: epoprostenol with sterile diluent

(epo-sterile), epoprostenol with pH12 diluent (epo-pH12), epoprostenol with arginine and sucrose (epo-ArgSuc) and treprostinil. Secondary outcomes include BSI incidence by causative microorganism, length of stay, and risk factors for BSIs.

**RESULTS:** 169 patients were included in the study. 14.2% were admitted with a diagnosis of BSI. There was a trend toward increased incidence of BSIs in treprostinil (30%) compared to epo-sterile (12.3%), epo-pH12 (22.2%), and epo-ArgSuc (0%) recipients, p=0.14. 20.8% of BSIs were due to gram-negative pathogens. A significantly higher percentage of BSIs due to gram-negative pathogens was seen among treprostinil (57%) compared to epoprostenol recipients (6.6%), p=0.02.

**CONCLUSION:** PAH patients receiving IV prostacyclins are at an increased risk of infection. 14.2% of PAH inpatients receiving IV prostacyclins were admitted with BSIs. Treprostinil recipients are significantly more likely than epoprostenol recipients to have BSIs due to a gram-negative pathogen, which may be due to the more neutral pH when mixing treprostinil.

**272. Nafcillin versus cefazolin for the treatment of methicillin-susceptible staphylococcus aureus bacteremia** *Leslie Wooten, Pharm.D.*, Maria Guido, Pharm.D., BCPS, Brittany Woolf, Pharm.D., BCPS, Elizabeth Stacy, Pharm.D., BCPS, Anthony Gentene, Pharm.D., BCPS, Siyun Liao, Pharm.D., Ph.D., BCPS; UC Health – University of Cincinnati Medical Center, Cincinnati, OH

**INTRODUCTION:** Beta-lactams are recommended for definitive treatment of methicillin-susceptible *Staphylococcus aureus*(MSSA) bacteremia. Clinical outcomes do not differ between anti-staphylococcal penicillins and cefazolin; *in vitro*data supports that type A beta-lactamase has high affinity for hydrolysis of cefazolin. This study aimed to investigate microbiologic clearanceof MSSA bacteremia treated with nafcillin compared to cefazolin.

**RESEARCH QUESTION OR HYPOTHESIS:** There is no difference in microbiologic cure of MSSA bacteremia treated with nafcillin compared to cefazolin.

**STUDY DESIGN:** This study is a retrospective single health system study including 326 hospitalized subjects 18 years and older with MSSA bacteremia who received definitive treatment with nafcillin or cefazolin.

**METHODS:** The primary outcome was time to microbiologic clearance. Secondary outcomes included factor contributing to prolonged bacteremia greater than 72 hours, inpatient mortality, relapse, and adverse events leading to drug discontinuation.

**RESULTS:** Definitive therapy with cefazolin occurred in 238 (73%) subjects. There was no difference in median time to microbiologic clearance with cefazolin compared to nafcillin (63.7 vs 66.3 hours, p = 0.27). In subjects with bacteremia greater than 72 hours, there was a longer time to microbiologic clearance in those treated with nafcillin (115.3 vs 150.9 hours, p=0.025). Presence of deep-seated and metastatic infection were the only identifiable risk factor that contributed to bacteremia for greater than 72 hours. There was a higher rate of treatment discontinuation due to adverse drug reactions in subjects treated with nafcillin compared to cefazolin (14% vs 1%, p < 0.001).

**CONCLUSION:** There is no difference in overall time to microbiologic clearance in subjects treated with cefazolin compared to nafcillin; however, those with bacteremia greater than 72 hours had decreased time to clearance with cefazolin. Bacteremia greater than 72 hours was associated with deep-seated and metastatic infections, not the antimicrobial choice. Cefazolin can be used effectively for the treatment of MSSA bacteremia.

**273. Evaluation of daptomycin plus ceftaroline outcomes in persistent methicillin-resistant staphylococcus aureus bacteremia** *Anh-Thu Truong, Pharm.D. Candidate, BS*[1], Kathy Choi, Pharm.D. Candidate, BS[1], Scott T. Hall, Pharm.D., BCPS[2], Vanthida Huang, Pharm.D., BSPHM, FCCP[1]; [1]Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ [2]HonorHealth John C. Lincoln Medical Center, Phoenix, AZ

**INTRODUCTION:** Multiple *in vitro* studies demonstrate ceftaroline (CPT) enhances the activity of daptomycin (DAP) against methicillin-resistant *Staphylococcus aureus* (MRSA), including vancomycin (VAN) and DAP-non-susceptible strains. Limited case reports demonstrate successful clinical outcomes with DAP+CPT combination in persistent MRSA bacteremia.

**RESEARCH QUESTION OR HYPOTHESIS:** This study aims to characterize and evaluate the use of DAP+CPT in MRSA bacteremia outcomes.

**STUDY DESIGN:** This is an observational case evaluation of patients who received DAP+CPT while admitted to all HonorHealth facilities between November 2012 and January 2018.

**METHODS:** The inclusion criteria include patients at least 18 years of age who received DAP+CPT for at least 72 hours. Clinical and microbiological cure, adverse events, susceptibility, treatment duration, length of stay (LOS), time to bacterial eradication, and mortality were evaluated.

**RESULTS:** A total of 21 patients received DAP+CPT therapy for MRSA bacteremia. Average LOS was 24.7 days. All blood cultures showed susceptibility to DAP and VAN (10 VAN MIC=1 mg/L and 11 MIC= 2 mg/L). VAN failure occurred in 13 cases, with 8 cases associated with MIC=2 mg/L. Blood cultures were persistently positive despite anti-MRSA treatment for average of 7.5 days prior to initiating DAP+CPT. DAP monotherapy was attempted following VAN failure in 5 cases, all remaining bacteremic for average 10.4 days before addition of CPT. Average time to culture clearance from initiation of DAP +CPT was 4.9 days. One patient showed addition of CPT after 9 days of DAP (MIC=4 mg/L) monotherapy, resulting in clearance after 2 days. Median DAP+CPT treatment duration for all cases was 11 days. Mortality (all-cause) occurred in 8 patients (38%). Microbiological cure before death occurred in 7 out of 8 patients.

**CONCLUSION:** DAP+CPT combination demonstrated effectiveness in clearing persistent bacteremia. Combination of DAP+CPT is an effective alternative option for patients who fail monotherapy or have high VAN and DAP MICs. Further study is warranted.

**274. Hepatitis c virus treatment in overweight and obese patients treated at an urban academic medical center** Darby Rosenfeld, Pharm.D.[1], Nadia Nabulsi, BS, MPH[2], Todd Lee, Pharm.D., Ph.D.[2], *Michelle T. Martin, Pharm.D.*[3]; [1]Option Care, Wood Dale, IL [2]Pharmacy Systems, Outcomes and Policy, University of Illinois at Chicago College of Pharmacy, Chicago, IL [3]Pharmacy Practice, University of Illinois at Chicago College of Pharmacy / University of Illinois Hospital and Health Sciences System, Chicago, IL

**INTRODUCTION:** Direct-acting antiviral (DAA) regimens offer high sustained virologic response (SVR) rates for hepatitis C virus (HCV) treatment. The CDC reports that over 70% of Americans are overweight or obese. Real world data in this growing patient population is needed.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the SVR rate in DAA-treated overweight/obese HCV patients at an urban academic medical center?

**STUDY DESIGN:** Retrospective cohort study

**METHODS:** Investigators reviewed electronic records of patients who started HCV treatment from 1/1/2014-12/1/2017. Patients with a BMI≥25kg/$m^2$ who started dual-DAA regimens were included. Data were described with counts/percentages for categorical data and means/standard deviations for continuous data. The primary endpoint was SVR for overweight+obese patients; rates were compared using chi-square or Fisher's exact tests with SAS software.

**RESULTS:** Of the 822 HCV-treated patients, 600(73%) were overweight/obese; and 536 started dual-DAA treatment. Patients were 60% male, 61% black, 41% Medicaid-insured, had a mean age of 59.7 (±8.4) years, and BMI of 31.8(±5.6) kg/$m^2$. The population was 91% genotype 1, 49% cirrhotic, 25% treatment-experienced, 10% post-transplant; 6% had hepatocellular carcinoma (HCC), 4% had HIV, 31% had diabetes, 24% had psychiatric illness, and 67% were treated with ledipasvir/sofosbuvir±ribavirin. The intent-to-treat SVR rate for this population was 86% (463/536). Excluding 30 patients lost-to-follow-up and 13 patients who discontinued treatment, the SVR rate was 94% (463/493) per protocol. SVR rates differed by presence of cirrhosis (F0-F3=98% vs F4=90%, p<0.0001), gender (male=90% vs female=98%, p=0.0004), treatment history (experienced=88% vs naïve=96%, p=0.0015), and history of HCC (HCC=82% vs no HCC=95%, p=0.0073). SVR rates did not differ by race/ethnicity, comorbidities, or insurance (p>0.05).

**CONCLUSION:** The majority of the HCV-treated patients were overweight or obese; they achieved a high SVR rate with dual-DAAs. Differences in SVR rates among subgroups were similar to those reported in the general HCV population: SVR rates were higher in treatment-naïve than treatment-experienced patients, and higher in non-cirrhotic than cirrhotic patients.

**275. Utility of procalcitonin to guide antibiotic management in a non-intensive care unit vs intensive care unit setting** *Samantha Jay, Pharm.D. Candidate 2019*[1], Ashley Hung, Pharm.D. Candidate 2019[1], Van Doan, Pharm.D. Candidate 2019[1], Stephen Ea, Pharm.D. Candidate 2019[1], Allison Chambliss, Ph.D.[2], Emi Minejima, Pharm.D.[1]; [1]USC School of Pharmacy, Los Angeles, CA [2]LAC+USC Medical Center, Los Angeles, CA

**INTRODUCTION:** Procalcitonin (PCT) is an inflammatory biomarker upregulated in response to bacterial infection that can be used to guide antibiotic management. An institutional algorithm was created and education on appropriate PCT interpretation was provided through email to the medical staff.

**RESEARCH QUESTION OR HYPOTHESIS:** The objective was to evaluate if the PCT algorithm was utilized similarly in the ICU vs. non-ICU setting and if the availability of PCT information provided clinical benefit.

**STUDY DESIGN:** Retrospective cohort study

**METHODS:** Adult, hospitalized patients ≥1 PCT level drawn between May 1,2017-May 31, 2017 were screened. Every third patient was randomly selected and evaluated for patient demographics, clinical course, and clinical outcomes. Patients were grouped by ICU vs. non-ICU admission at the onset of infection and compared for demographics, PCT levels, and outcomes. The primary outcome was 30-day all-cause mortality and total duration of antibiotic therapy. Data was stored on REDCap database software.

**RESULTS:** 101 patients were evaluated, mean age was 51 years old, 66% male, and 54% in the ICU at the onset of infection. The most common comorbidities were hypertension(26%), diabetes mellitus(26%), and obesity(18%). The most common physician documented indications for antibiotic therapy were pneumonia (17%) and sepsis(11%). Initial PCT levels were significantly higher in the ICU group(median 0.59 ng/mL vs 0.18 ng/mL, p=0.0010), with more patients getting >1 PCT level(ICU 54% vs. non-ICU 11%, p=<0.0001). 24% of ICU and 40% of non-ICU patients received PCT guided antibiotic management(p=0.08). Total antibiotic duration(ICU 15d vs. non-ICU 10d, p=0.22) and 30-day mortality(ICU 14% vs. non-ICU 6%, p=0.18) were similar between the groups. Of the PCT-guided patients(n=32), antibiotic duration was significantly shorter(6.5d) than non-PCT-guided patients(12.3d) (p=0.021).

**CONCLUSION:** Adherence to the PCT algorithm and decision making based on PCT level was suboptimal at our institution, in ICU and non-ICU setting. Additional antimicrobial stewardship intervention is warranted to educate clinicians on the interpretation of the PCT algorithm.

**276. Monte Carlo analysis of omadacycline and tigecycline against methicillin-susceptible and methicillin-resistant staphylococcus aureus** *Maha Assadoon, Pharm.D. Candidate*[1], Roger White, Pharm.D.[2]; [1]School of Phamacy, Medical University of South Carolina (MUSC), Charleston, SC [2]MUSC department of Biomedical Science, Charleston, SC

**INTRODUCTION:** Omadacycline (OMD) is an aminomethylcycline in development for skin and skin structure infections. Tigecycline

(TIG) is a glycylcycline used for complicated skin and skin structure infections.

**RESEARCH QUESTION OR HYPOTHESIS:** Are there differences in target attainment between OMD and TIG against MRSA and MSSA?

**STUDY DESIGN:** Monte Carlo Analysis (MCA)

**METHODS:** Wild-type MICs, PK and PD targets from literature were used as MCA inputs. Protein binding (21% OMD, 40% TIG), clearance (L/hr, 11 – 17 OMD and 15.7 – 22 TIG), volume (healthy and patients) and PD targets [stasis (no net bacterial killing), 1 log killing] were used. Dosage regimens were: OMD 100 – 200 mg IV Q24H (inf 0.5 hrs) and TIG 50 – 100 mg IV Q12H (inf 1 hr). Using the PK parameters (1-comp model) and MICs, free (f) AUC/MICs (24 hrs) and target attainment (TA%) was calculated. Results (80kg patient) were:

**RESULTS:**

| | | | %TA (stasis / 1 log killing) | |
|---|---|---|---|---|
| **Drug** | **Regimen** | **Clearance (L/ hr)** | **MRSA** | **MSSA** |
| OMD | 100mg Q24H | 11 | 91/ 81 | 98/ 85 |
| | | 17 | 91/ 43 | 85/ 42 |
| | 200mg Q24H | 11 | 95/ 91 | 99/ 98 |
| | | 17 | 95/ 81 | 98/ 85 |
| TIG | 50mg Q12H | 15.7 | 98/ 98 | 100/ 100 |
| | | 22 | 98/ 81 | 100/ 86 |
| | 100mg Q12H | 15.7 | 100/ 100 | 100/ 100 |
| | | 22 | 100/ 100 | 100/ 100 |

TA% was affected by clearance, especially at the higher target. Dosage regimen had a minimal impact; however, TA% was lowest at the lower dose and higher target. There were minimal differences in TA% between MRSA and MSSA.

**CONCLUSION:** OMD TA% was >90% with the stasis target; however, TA% was 42 – 98% using 1 log killing. For TIG, TA% was >95% at the stasis target and ≥81% using 1 log killing. Overall, TIG had slightly higher TA% than OMD; however, OMD will likely be clinical efficacious against both MRSA and MSSA.

**277. Evaluation of empiric vancomycin and beta-lactam therapy on outcomes of staphylococcus aureus bacteremia** *Nikki Mai, Pharm.D. Candidate*; University of Southern California School of Pharmacy, Los Angeles, CA

**INTRODUCTION:** Previous studies found mortality benefit in patients receiving early vancomycin and anti-Staphylococcal beta-lactam in *Staphylococcus aureus* bacteremia (SAB), although the benefit of receiving other beta-lactam therapy with vancomycin empirically is unclear.

**RESEARCH QUESTION OR HYPOTHESIS:** Empiric vancomycin with any beta-lactam improved survival in SAB.

**STUDY DESIGN:** Multi-centered, prospective, observational cohort study.

**METHODS:** Adult patients with monomicrobial SAB admitted from 2012-2017 were screened. Exclusion criteria include: receiving <48h of effective therapy, empiric therapy other than vancomycin or beta-lactam, and starting effective therapy >48h after SAB onset. Medical charts were reviewed. Patients were grouped by receipt of empiric vancomycin and beta-lactam (combination group) vs. vancomycin monotherapy (vancomycin group) and compared for demographics, clinical presentation, and outcomes. Primary outcome was day 4 success; secondary outcomes included 30d mortality, duration of SAB, and length of stay.

**RESULTS:** 712 patients were included: 57% (n=409) received combination therapy. Mean age was 56yo, 71% were male, and 35% had MRSA SAB. The most common empiric beta-lactam in the combination group was ceftriaxone (48%). Over half of patients had intermediate source risk (combination 54% vs. vancomycin 60%, P=0.08); the combination group had significantly more endocarditis (11% vs. 6%, P=0.02). The combination group had worse clinical presentation with higher Pitt Bacteremia Score (1 vs. 0, P=0.04) and ICU admission (46% vs. 35%, P=0.003). Duration to initiate optimal therapy was 2d in both groups (P=0.56). Patients with MSSA SAB had improved day 4 clinical success (73% vs. 63%, P=0.046), shorter length of stay (10 vs. 12d, P=0.03), and a shorter duration of bacteremia (1 vs. 1.5d, P=0.02), although 30d mortality was similar (8% vs 7%, p=0.71). This trend was not seen with MRSA SAB (all comparisons p=ns).

**CONCLUSION:** Empiric combination therapy of vancomycin with any beta-lactam led to significantly faster clearance of SAB and early clinical success compared to vancomycin alone for MSSA SAB, but not for MRSA SAB.

## MANAGED CARE

**278E. Pharmacist clinical interventions and discharge counseling in medical rehabilitation wards** Nga Suet Rosanna Ip, Bachelor of Pharmacy[1], Chun Kwok Angus Chu, MB BS (HK); MRCP (UK); FHKAM (Medicine)[2], Lai Ming Pauline Chu, MPharm, MRPharmS[1], Wai Man Grace Young, Master of Clinical Pharmacy[1], *Justin Wade Tenney, Pharm.D., BCPS, BCGP, AE-C*[3]; [1]Department of Pharmacy, Tuen Mun Hospital, Hong Kong, Hong Kong [2]Department of Medicine and Geriatrics, Tuen Mun Hospital, Hong Kong, Hong Kong [3]School of Pharmacy, The Chinese University of Hong Kong, Hong Kong, Hong Kong
Presented at the 78th FIP World Congress of Pharmacy and Pharmaceutical Sciences, The International Pharmaceutical Federation, Glasgow, UK, September 2-6, 2018.

**279. The impact of a methadone policy change in the Oregon Medicaid population** *Tiffany Tsai, Pharm.D.*, Deanna Moretz, Pharm.D., Luke Middleton, BS, Megan Herink, Pharm.D.; College of Pharmacy, Oregon State University/Oregon Health & Science University, Portland, OR

**INTRODUCTION:** Overuse or misuse of methadone can lead to respiratory depression or cardiac arrest due to its long half-life, variable

pharmacokinetics, and a delayed onset of action. From 2000 to 2011, methadone was associated with over 50% of prescription opioid-related deaths in Oregon. Due to safety concerns, in January 2014, methadone was removed from the preferred drug list in the Medicaid population.

**RESEARCH QUESTION OR HYPOTHESIS:** The objectives were to evaluate methadone utilization and its impact on hospitalizations or emergency department (ED) visits after the policy change.

**STUDY DESIGN:** Retrospective, observational analysis

**METHODS:** Utilization of methadone in 2013 was compared to 2014 using paid Oregon Medicaid pharmacy claims. Patients were excluded if they had dual Medicare Part D coverage, loss of Medicaid eligibility, or a diagnosis of palliative care with a terminal diagnosis or cancer-related pain. Descriptive statistics were used to report and compare methadone utilization and hospitalizations or ED visits.

**RESULTS:** There was a significant decline in methadone utilization, with an average of 128 claims per month in 2013 out of 50,777 members (2.53 per-member-per-month (PMPM) x1000) compared to 42 claims per month in 2014 out of 110,195 members (0.39 PMPM x1000). Overall, the methadone policy did not seem to directly impact rates of methadone hospitalizations or ED visits from 2013 to 2014 (1.38 PMPM x10,000 vs. 1.41 PMPM x10,000). Nonetheless, an overall downward trend was observed from 2011 to 2017. Conversely, there was an overall upward trend in heroin hospitalization/ED visits from 2011 to 2017.

**CONCLUSION:** Methadone restriction in the Oregon Medicaid FFS population effectively limited its use for chronic pain, but had minimal impact on hospitalizations/ED visits. The increasing trend in heroin overdose concur with the national trend, but there is insufficient evidence for its association with restriction of prescription opioids.

**280. Gabapentin utilization in the Oregon Medicaid fee-for-service population** *Pearce Engelder, Pharm.D.*, Deanna Moretz, Pharm.D., Luke Middleton, BS and Megan Herink, Pharm.D.; College of Pharmacy, Oregon State University/Oregon Health & Science University, Portland, OR

**INTRODUCTION:** Gabapentin is approved for use in partial onset seizures and postherpetic neuralgia but is often used for other pain-related diagnoses, despite lacking evidence for benefit. Following the publication of the 2016 Centers for Disease Control (CDC) guidelines on opioid use in chronic pain and subsequent restrictions on opioid therapies, gabapentin may be an appealing alternative.

**RESEARCH QUESTION OR HYPOTHESIS:** Describe gabapentin utilization in Oregon's fee-for-service Medicaid program and how that has changed since the CDC guidelines.

**STUDY DESIGN:** This is a cross-sectional, observational study comparing gabapentin utilization and prescribing patterns prior to and following release of the CDC guidelines.

**METHODS:** Patients with paid gabapentin claims between 2/1/2015 and 6/30/2017 were included; pre- and post-CDC cohorts were designated for comparison. Those with Medicare part D coverage or a seizure diagnosis were excluded. Average daily gabapentin dose was calculated and concurrent opioid use was described. Diagnoses were flagged and categorized as FDA approved, non-FDA approved with evidence for use, no evidence for use, and no indication found.

**RESULTS:** Average gabapentin utilization increased by 2 prescriptions per 1000 members per month from January 2015 to December 2018. There were 828 chronic gabapentin users in the pre-cohort and 894 in the post-cohort; concomitant opioid use between cohorts decreased from 24.5% to 19.5%. Seventy-five percent of users had average gabapentin doses less than 1,800 mg/day. When used concomitantly with opioids, gabapentin doses averaged 262-350 mg/day higher. Use for chronic musculoskeletal pain was higher in the post-cohort (44.4% compared to 24.8%), despite lacking evidence for efficacy in this population. More patients in the post-cohort had short-term gabapentin, described as less than 30 days (70.1% compared to 64.2%).

**CONCLUSION:** Modest increases in gabapentin use following the publication of the CDC guidelines seems to be related to short-term use for non-evidenced indications. No significant safety or misuse concerns were identified.

## MEDICATION SAFETY

**281. Vancomycin-induced acute kidney injury in elderly patients: a cross-sectional study from a single center in china** *Kunming Pan, Master*[1], Yi Wu, Bachelor[1], Can Chen, Master[1], Zhangzhang Chen, Master[1], Wu Wei, Master[2], Cao Lei, Bachelor[1], Qing Xu, Bachelor[1], Xu Jian-an, Bachelor[1], Peifang Dai, Bachelor[1], Xiaoyu Li, Doctor[2], Qianzhou Lv, Doctor[2]; [1]Department of Pharmacy, FuDan University Zhongshan Hospital, ShangHai, China [2]Department of Pharmacy, Zhongshan Hospital Affiliated to Fudan University, ShangHai, China

**INTRODUCTION:** Acute kidney injury (AKI) is still the main serious adverse drug reaction experienced by patients receiving vancomycin (VAN) treatment. Older people and race (black) are risk factors for VAN nephrotoxicity. However, studies of the elderly Chinese patients are very limited, and little is known about the risk factors for VAN-induced AKI(VI-AKI) among Chinese individuals.

**RESEARCH QUESTION OR HYPOTHESIS:** To investigate current situation of VI-AKI in elderly Chinese patients and identify the risk factors for VI-AKI, to access the outcomes and its risk factors of patients who developed VI-AKI, in order to provide suggestions for improving the prevention and treatment of VI-AKI in elderly Chinese.

**STUDY DESIGN:** single-center retrospective study

**METHODS:** We retrospectively identified elderly in-patients who received 4 or more doses of VAN therapy. We compared the VI-AKI with NO-AKI patients. The definition of VI-AKI is developing AKI during VAN therapy or within 3 days after withdrawal of VAN.

**RESULTS:** 647 of the 862 elderly inpatients were included. Among those excluded, (89.3%, 192/215) were excluded because of a lack of data on serum creatinine (SCr). Among the included patients, 32.5% (210/647) patients received TDM during VAN therapy. The inadequate TDM rate was 66.9% (424/634) and rate of correct TDM was 3.9% (25/634). 102 patients had confirmed VI-AKI, with an incidence

of 15.8% (102/647). Multiple logistic regression analysis revealed that hyperuricemia ([OR]=3.045;p=0.000), mechanical ventilation ([OR] =1.906;p=0.022) and concomitant vasopressor therapy ([OR]=1.919, p=0.027) were independent risk factors for VI-AKI; in addition, serum albumin valley ([OR]=0.885;p=0.000) was determined to be independent protective factor for VI-AKI.

**CONCLUSION:** The elderly Chinese patients treated with VAN exist the situations below: insufficient monitoring of SCr, inadequate VAN TDM rate and incorrect monitor time. We recommend hospital managers to increase investment in clinical pharmacists to strength professional management. Patients concomitant with hyperuricemia, mechanical ventilation and vasopressor therapy should be paid more attention and a higher serum albumin was more recommend.

**282. Risk factors of vancomycin-induced acute kidney injury in critically ill elderly undergoing surgery** *Kunming Pan, Master*[1], Can Chen, Master[1], Zhangzhang Chen, Master[1], Jin Zhi-ping, Bachelor[1], Wu Wei, Master[2], Qing Xu, Bachelor[1], Xiaoyu Li, Doctor[2], Qianzhou Lv, Doctor[2]; [1]Department of Pharmacy, FuDan University ZhongShan Hospital, ShangHai, China [2]Department of Pharmacy, Zhongshan Hospital Affiliated to Fudan University, ShangHai, China

**INTRODUCTION:** Acute kidney injury (AKI) is the main serious adverse drug reaction of VAN and AKI is the common complication after surgery. Older patients are with a higher risk of VAN-induced AKI (VI-AKI). However, study about VI-AKI in this special population was very few.

**RESEARCH QUESTION OR HYPOTHESIS:** To investigate the incidence and risk factors of VA-AKI in critically ill elderly patients undergoing surgery and give some suggestions for the rational use of VAN in critically ill elderly patients during perioperative period.

**STUDY DESIGN:** Single-center, retrospective cohort study.

**METHODS:** We investigate all the inpatients who received VAN therapy from January 1, 2016 to June 31, 2017 in our hospital. The inclusion criteria were as follows: 1 age ≥65 years, 2 accept at least 4 doses of VAN therapy, 3 undergo surgery. The exclusion criteria: 1 CKD 5 or receiving regular hemodialysis, 2 renal transplant status, 3 with incomplete medical record information, 4 lack of serum creatinine (SCr) monitoring. We compared the VI-AKI with NO-AKI patients. The definition of VI-AKI is developing AKI during VAN therapy or within 3 days after withdrawal of VAN.

**RESULTS:** 163 patients were included and the incidence of VI-AKI was 19.6% (32/163). Multivariate regression analysis showed that the higher rate of TDM of VAN trough concentration (OR = 2.907, p = 0.02) was an independent risk factor for VI-AKI. Lower serum albumin valley (OR = 0.9, p = 0.02) and lower baseline evaluated glomerular filtration rate (eGFR) (OR = 0.985, p = 0.003) were independent protective factors for VI-AKI.

**CONCLUSION:** Higher rate of TDM of VAN trough concentration was an independent risk factor for VI-AKI. Lower serum albumin lower baseline eGFR (OR = 0.985, p = 0.003) were independent protective factors for VI-AKI. Concomitant with nephrotoxic drugs may have little effect on VI-AKI. Clinicians should more attention on the treatment of patients' pathophysiology.

**283. Analysis of quetiapine and olanzapine misuse using the FDA adverse event reporting system** *Victor Encarnacion, Pharm.D. Candidate*[1], Kirk Evoy, Pharm.D.[1], Chengwen Teng, Pharm.D., MS[1], Lindsey Groff, BS, Pharm.D. Candidate[1], Huda Razzack, Pharm.D. Candidate[2], Obiageri Obodozie-Ofoegbu, BPharm, MSc, Ph.D.[1], Christopher Frei, Pharm.D., MS, FCCP, BCPS[1]; [1]The University of Texas at Austin College of Pharmacy and University of Texas Health San Antonio Long School of Medicine, San Antonio, TX [2]The University of Texas at Austin College of Pharmacy, Austin, TX

**INTRODUCTION:** Second Generation Antipsychotics (SGAs) are assumed to have low abuse potential; however, published reports of abuse have emerged for quetiapine as prescribing has increased in recent years. The U.S. Food and Drug Administration's (FDA) Adverse Event Reporting System (FAERS) provides post-marketing information regarding abuse-related Adverse Drug Reports (ADRs).

**RESEARCH QUESTION OR HYPOTHESIS:** Is there a disproportionate rate of abuse-related ADRs with quetiapine versus another commonly used SGA, olanzapine?

**STUDY DESIGN:** A cross-sectional analysis was performed using data from spontaneous ADR reporting in FAERS from 1-1-2015 to 12-31-2017.

**METHODS:** The total volume of ADRs related to quetiapine and olanzapine (Qt and Ot) were identified by querying the drugs' generic and brand names. Then, abuse-related ADRs for each drug (Qa and Oa) were quantified by querying each drug in conjunction with twenty predefined ADR descriptors related to abuse/misuse/dependence/overdose. Descriptors were identified through search strategies of previously conducted ADR reporting system studies. The Proportional Reporting Ratio [PRR=(Qa/Qt) / (Oa/Ot)] was calculated to assess whether reporting of abuse-related ADRs between the two drugs was disproportionate.

**RESULTS:** Abuse-related ADRs represented 11% of total ADRs reported for quetiapine (3144/27692) and 8% for olanzapine (1458/19228), resulting in a PRR of 1.41. PRRs (Qa/Qt, Oa/Ot) for the three most prevalent ADRs studied were: drug abuse = 1.92 (895/27692, 324/19228), intentional overdose = 1.14 (545/27692, 331/19228) and overdose = 0.91 (823/27692, 626/19228). Quetiapine patients with abuse-related ADRs were younger (median of 44 vs. 52 years, p<0.0001) and more likely to experience a fatal event (21% vs. 15%, p<0.0001) than those quetiapine patients without abuse-related ADRs.

**CONCLUSION:** This study described new evidence regarding the abuse-potential of quetiapine (relative to olanzapine) that further corroborates recent evidence of quetiapine abuse. More rigorous studies should be conducted to better understand the abuse potential of quetiapine and its impact on practice.

**284. Impact of a medication safety educational fair on health care professionals' knowledge and adherence to established processes**

**for medication safety** *Merlyn L. Joseph, Pharm.D.*[1], Beth Willis, Pharm. D.[2]; [1]Irma Lerma Rangel College of Pharmacy, Texas A&M University Health Science Center, Houston, TX [2]Memorial Hermann Memorial City, Houston, TX

**INTRODUCTION:** Voluntary reporting of medication errors at Memorial Hermann Memorial City (MHMC) has demonstrated significant opportunities for improvement in a few key areas. Several errors with high risk medications were reported despite a documented second clinician check on the drug, signifying the need to refine and educate nurses on the independent double check process at our institution. Additionally, several intravenous (IV) pump programming errors and heparin errors indicate the need to reeducate on important steps during pump programming.

**RESEARCH QUESTION OR HYPOTHESIS:** A medication safety fair improves nurses' knowledge and compliance with safe medication practices in areas with reported medication errors.

**STUDY DESIGN:** A single-center prospective quality improvement project

**METHODS:** MHMC nurses who attended the medication safety fair and completed the pre- and post-survey were included. Surveys were matched using raffle ticket numbers to ensure anonymity. Descriptive statistics were used for nominal data. Wilcoxon Signed Ranks was used to compare paired surveys (IBM SPSS Statistics 24).

**RESULTS:** Seventy-nine nurses completed the pre- and post-survey (75% response rate). Seventy percent of nurses have been a healthcare professional for over 5 years and 35% of nurses reported attending a previous medication safety fair. Many nurses worked in medical/surgical units (35%) or critical care units (31.6%). Statistically significant improvement in nurses' knowledge was demonstrated in the independent double-check process (p=0.021), heparin weight-based protocol (p=0.008), heparin double-check process (p=0.022), and the Alaris Pump programming for IV fluids (p=0.001). Minimal improvement was observed in identifying that all IV medications should be traced (35.4% pre-survey vs 43% post-survey, p=0.263).

**CONCLUSION:** The medication safety fair statistically improved nurses' knowledge in 4 of the 5 medication safety topics tested. This data emphasizes the need for continued education to ensure 100% of our nurses follow safe medication practices, especially with high-risk medications.

**285. Efficiency journey: utilizing lean six sigma methodology on admission medication reconciliation in a large hospital system** *Sara Eltaki, Pharm.D., BCPS*[1], Natalie Zilban, Pharm.D., MPH, BCGP[2], Amada Alonso, MSIE, MIA, LSSBB[2]; [1]Department of Pharmacy, Memorial Regional Hospital, Hollywood, FL [2]Memorial Healthcare System, Fort Lauderdale, FL

**INTRODUCTION:** Medication Reconciliation is a complex process ensuring medication safety. The Joint Commission has recognized reconciliation, a National Patient Safety Goal, as being essential to providing optimal care. A large hospital system in Florida consisting of six facilities of varying size employed varying legacy methodologies for medication reconciliation amongst its providers.

**RESEARCH QUESTION OR HYPOTHESIS:** Utilize standardization to increase efficiency, define provider roles and, ultimately, maximize the number of patients receiving robust medication reconciliation.

**STUDY DESIGN:** A multidisciplinary team consisting of varying providers from across the system, including pharmacy, nursing, physicians, informatics and process improvement (PI) personnel was formed to define and implement a new standardized medication reconciliation process.

**METHODS:** Legacy and proposed future-state processes were reviewed through Lean Six Sigma methodologies including data-driven analysis (DMAIC – Define, Measure, Analyze, Improve and Control), process mapping (SIPOC – Suppliers, Inputs, Process, Outputs, Customers), and Gemba walks.

**RESULTS:** Numerous non-value-added steps were identified within all workflows through stakeholder involvement. An improved, streamlined process was developed to eliminate such process defects and was approved for implementation across the system. A pilot was conducted, achieving a 67% decrease in time spent on medication reconciliation.

**CONCLUSION:** A significant decrease in resources required for medical reconciliation was achieved through the utilization of Lean Six Sigma methodology. Non-value-added steps were identified by stakeholders and eliminated, allowing for the development and implementation of a streamlined reconciliation process across the hospital system.

**286. Evaluation of potential adverse drug events (PADEs) of inpatient in Taiwan** *Yiming Hua, MS*, Hsing-Chun Hsieh, MS, Yao-Chung Chang, MS, Wan-jyun Ciou, MS, Hui-Chen Su, Ph.D; Department of Pharmacy, Chi Mei Medical Center, Tainan, Taiwan

**INTRODUCTION:** In Taiwan, physicians usually resume ambulatory drugs for each inpatient without assessing these medications with drugs prescribed during the hospitalization. Potentially harmful drug-related adverse events resulting from medication discrepancies may occur during transition of care.

**RESEARCH QUESTION OR HYPOTHESIS:** We aim to evaluate PADEs identified by a pharmacist-led medication reconciliation service for inpatients.

**STUDY DESIGN:** Cross-sectional study

**METHODS:** We initiated a pharmacist-led medication reconciliation service to analyze PADEs for admitted inpatients. For each patient, the pharmacist assesses all resumed ambulatory medications prescribed during their hospitalization and identify drug related problems. PADEs would be recorded on medical records once medication discrepancies were recognized. We documented numbers and types of PADEs from different ward specialties. T-test and chi-square test were used to explore association of demographics between patients with and without PADEs. Statistical analysis is carried out by SAS ver.9.4. Tests were two-sided and the data is considered statistically significant when p-value < 0.05.

**RESULTS:** We had evaluated 3578 patients (3870 total prescriptions) between January 2018 and April 2018. 300 patients were identified

with PADEs (8.38%). Among these, 80% had 1 PADE while others had more than 2 PADEs. Patients with PADEs were significantly older than those without (69±13 vs 65±17, p<0.001). In patients with PADEs, the most frequent type was duplicate medications (47%) followed by adverse drug reactions (ADRs) (27%) and organ impairment requiring dose adjustment (10%). Among all assessed prescriptions, more than 50% were from internal medicine ward. However, incidence rate of PADE is higher in surgery (11.6%) than in other specialties.

**CONCLUSION:** Patients with PADEs were found to be older, which might relate to higher proportion of polypharmacy and comorbidities. Furthermore, duplications and ADRs occurred more frequently in hospitalized patients. This may imply us of putting more efforts on accessing accurate medication history and identifying high-risk patients to facilitate drug safety.

**287. Assessing hospital inpatients' knowledge of medication adverse effects: a sub-analysis of the "use of medication knowledge, adherence, and lace plus scores for prediction of hospital readmissions" study** *Alice Hemenway, Pharm.D.*; Department of Pharmacy Practice, University of Illinois at Chicago College of Pharmacy, Rockford, IL

**INTRODUCTION:** A low level of patient knowledge regarding potential adverse effects of their medications has been noted in various studies, however there is limited information regarding adverse effect knowledge of hospitalized patients. Hospitalized patients receive information on medications from various providers throughout their admission which may affect their knowledge.

**RESEARCH QUESTION OR HYPOTHESIS:** When compared to other medication information, do hospitalized patients have less knowledge in regards to potential adverse effects of their medications?

**STUDY DESIGN:** Sub-analysis of a prospective, randomly-selected, single-center study.

**METHODS:** IRB approval was obtained and data was collected from January to August 2017. Patients were randomly selected and included if they were on at least one scheduled medication for six months prior to admission, and capable of responding to questions. Patients were excluded if they were admitted to intensive care, surgical, or obstetric floors, or readmitted within 30 days of a prior admission. The validated Medicated Knowledge Score (MKS) was orally administered to patients, which includes four questions about medication name, indication, strength or frequency, and potential adverse effects. The primary endpoint was comparison of frequencies of correct individual MKS answers, and was compared using descriptive statistics and the Chi-squared test using IBM SPSS, version 24.

**RESULTS:** 120 patients were included in the analysis. A greater number of patients could list a name of one of their medications (91.7%), its indication (93.3%), or strength or frequency (91.7%), as compared to a potential adverse effect (41.7%, p< 0.005 for all comparisons). The majority of patients had moderate-high MKS scores (85% scored 3 or 4; 15% 1 or 2). Of patients who could not list an adverse effect, 74.3% had moderate-high MKS scores, and 25.7% had low MKS scores.

**CONCLUSION:** In confirmation with prior studies, hospitalized patients seem to specifically lack knowledge regarding potential adverse effects of their medications.

**288. The impact of pharmacy team involvement on readmission due to medication related events** Nicole Fabre-LaCoste, Pharm.D., BCPS, BCGP[1], Monica Morgan, Pharm.D.[2], *Heather Savage, Pharm.D.*[3]; [1]Medication Use, Safety and Education, Ochsner Medical Center, New Orleans, LA [2]Ochsner Health System, New Orleans, LA [3]Ochsner Clinic Foundation, New Orleans, LA

**INTRODUCTION:** The pharmacy team is in the ideal position to take responsibility for medication use processes throughout different transitions of care. It has been shown that pharmacists obtain more accurate medication-related information than both physicians and nurses. Additionally, there is evidence to support pharmacy team involvement in reducing errors in the medication use process. Studies show that the pharmacy team can make impactful changes on patient care and readmissions.

**RESEARCH QUESTION OR HYPOTHESIS:** Does pharmacy team intervention reduce readmissions due to medication related problems? What type of pharmacy team intervention has the biggest impact on readmission rates due to medication related problems?

**STUDY DESIGN:** Retrospective, observational chart review.

**METHODS:** Patients admitted to a hospital medicine team between December 1, 2017 and October 31, 2018 and readmitted within 90 days were included. The primary outcome of the study was readmission due to a medication related problem. Pharmacy team interventions included a pharmacist on the primary team, admission and discharge medication reconciliation, pharmacy consult, and patient education. The Pharmaceutical Care Network Europe (PCNE) Classification V 8.02 was used to identify possible causes of medication related problems.

**RESULTS:** One hundred and fifty patients were included. Readmissions were higher due to medication related problems when there was no pharmacy team involvement, compared to when there was pharmacy team involvement (49.3% vs 28.9%; p=0.011). Median time to readmission was similar between groups. Fewer patients in the pharmacy team intervention group were readmitted for patient-specific factors (i.e. incorrect dosage, nonadherence, etc.). The most common pharmacy team intervention was the presence of a pharmacist on the primary team.

**CONCLUSION:** Pharmacy team involvement led to fewer readmissions due to medication related problems. The PCNE classification V 8.02 is a useful classification tool to determine readmissions due to medication related problems.

**289. As-needed intravenous labetalol and hydralazine use in hospitalized ward patients** *Valerie Magda, Pharm.D. Candidate*, Tess Calcagno, Pharm.D. Candidate, Briana Schreckengost, Pharm.D. Candidate, Courtney A Montepara, Pharm.D., Jordan R Covvey,

Pharm.D., Ph.D., BCPS, Branden D Nemecek, Pharm.D., BCPS; Duquesne University School of Pharmacy, Pittsburgh, PA

**INTRODUCTION:** The use of intravenous (IV) medications for blood pressure (BP) control in the inpatient setting is common but generally lacks evidenced clinical guidance or recommendations.

**RESEARCH QUESTION OR HYPOTHESIS:** To assess the safety and efficacy of as-needed IV hydralazine/labetalol in non-intensive care patients in a large academic teaching hospital.

**STUDY DESIGN:** Single center retrospective chart review

**METHODS:** A sample of electronic medical records for hospitalized patients at UPMC Mercy who received IV hydralazine and/or labetalol between 2013-2017 was retrospectively reviewed. Patients in the intensive care unit, emergency department, or in a procedure during medication administration were excluded. Vitals (systolic/diastolic BP and heart rate [HR]) were evaluated at admission, discharge, and post-IV administration to assess for safety/efficacy. The study was approved by the pertinent institutional review boards.

**RESULTS:** A total of 430 patients were included, with 200 (46.5%) who received only hydralazine, 131 (30.5%) who received only labetalol, and 99 (23.0%) who received either during admission. Patients in the labetalol group had a higher mean HR on admission (91.34 vs 81.1 bpm, p<0.001) and discharge (80 vs 75.6 bpm, p=0.0095) compared to hydralazine. A greater number of IV labetalol doses during admission were administered compared to IV hydralazine (4.2 vs 3.2 doses/patient; p=0.03). Significant decreases in systolic BP (mean difference [MD]: -21.7 mmHg, p<0.001), diastolic BP (MD: -10.5 mmHg; p<0.001), and HR (MD: -8.3 bpm; p<0.001) occurred between admission and discharge across all patients, with the largest decreases among patients who received a combination of the two IV medications during admission (MD: -27.4 mmHg, -15.1 mmHg, and -9.7 bpm, respectively; all p<0.001).

**CONCLUSION:** Use of a combination of IV hydralazine and labetalol during hospitalization appears to produce the most significant reduction in BP, although the safety associated with this reduction should be assessed on a patient-specific basis.

**290. By implementing of medication reconciliation to improve the medication safety of patients with polypharmacy issues** *YenRong Chiu, B. S. in Pharmacy*, GuanLing Lin, MS, TaWei Wu, MS; Department of Pharmacy, Taipei Tzu Chi Hospital, New Taipei City, Taiwan

**INTRODUCTION:** Medical practices in Taiwan are divided into different specialities in order to provide more professional medical services. Patients suffering from different diseases concomitantly need to visit different specialty doctors or clinics. According to statistics of the National Health Insurance Administraion, the largest medication problems were cross-hospital repeated prescriptions. Consequently, the generated polypharmacy issues lead to a potential risk in medication safety.

**RESEARCH QUESTION OR HYPOTHESIS:** Reduce the occurrence of duplicated medications, drug interactions, and other adverse drug events through medication reconciliation.

**STUDY DESIGN:** We used retrospective meta-analysis to analyze the medication reconciliation contents of the drug information counter, including patient source, consultation needs, pharmacist service category, the degree of patient understanding, tracking results and tracking timeliness after medication reconciliation between Jan 2017 and Dec 2017.

**METHODS:** When patients asked for medication reconciliation support, we used "present medication system" developed by Department of Informatics in our hospital, "PharmaCloud System" developed by government and medication lists provided by patient to understand their current medication. We also searched online medical literature databases checking drug-drug/drug-food interactions and precautions for patients and confirmed the degree of their understanding. However, we included not only patients who consulted voluntarily but also those patients who had high risks of polypharmacy referred to drug information counter for further reconciliation.

**RESULTS:** There were 327 polypharmacy cases which needed medication reconciliation supports. 70% of them were outpatients. Total 218 (66.7%) cases were for those patients taking medicines prescribed from two or more specialty doctors simultaneously. The tool we used mostly (80.2%) to achieve medication reconciliation was "present medication system". All medication discrepancies found during reconciliation were confirmed with doctors. Most doctors (80%) modified the prescription based on pharmacist's recommendations. After reconciliation, almost all patients (99.4%) could totally understand the contents educated by pharmacists.

**CONCLUSION:** By implementing such a practice of medication reconciliation from pharmacists, patient medication safety will be improved.

**291. Cardiovascular safety of revefenacin for nebulization: a review of randomized controlled trial data** James Donohue, MD[1], Gregory Feldman, MD[2], Sanjay Sethi, MD[3], Chris Barnes, Ph.D.[4], Srikanth Pendyala, MD[4], David Bourdet, Ph.D.[4], *Lauren Yarbrough, Pharm.D.*[4]; [1]UNC School of Medicine, Chapel Hill, NC [2]S. Carolina Pharmaceutical Research, Spartanburg, SC [3]University at Buffalo School of Medicine, Buffalo, NY [4]Theravance Biopharma US, Inc, South San Francisco, CA

**INTRODUCTION:** Revefenacin, a once-daily, lung-selective, long-acting muscarinic receptor antagonist in clinical development for the nebulized treatment of chronic obstructive pulmonary disease (COPD), produces sustained bronchodilation with limited adverse events (AEs).

**RESEARCH QUESTION OR HYPOTHESIS:** As cardiovascular (CV) disease is highly prevalent in COPD patients, we evaluated CV safety data from 3 revefenacin randomized trials.

**STUDY DESIGN:** Daily nebulized revefenacin 88 μg and 175 μg was evaluated for CV safety in patients with moderate to very severe COPD in 2 identical, 12-week, placebo-controlled, phase 3 trials (Study 0126, N=619; Study 0127, N=611), and an active-controlled, 52-week, phase 3 safety trial (Study 0128, N=699).

**METHODS:** An independent clinical events committee (CEC) performed blinded review and adjudication of major CV AEs (MACE).

**RESULTS:** No clinically meaningful changes in 12-lead ECG recordings were observed. The incidences of prolonged QTcF interval (>450

msec) were similar in the placebo (4.9% and 5.8%), and revefenacin 88 μg (6.3% and 4.9%) and 175 μg (5.1% and 6.7%) arms (Studies 0126 and 0127, respectively). In Study 0128, the incidences of prolonged QTcF were similar in the revefenacin 175 μg (7.7%) and tiotropium (7.3%) groups, and slightly lower in the revefenacin 88 μg group (4.2%). After CEC adjudication, there were 4 MACE in Study 0126 (2, 1, and 1 in the revefenacin 88 μg, 175 μg, and placebo groups, respectively), zero MACE in Study 0127, and 26 MACE in Study 0128 (9, 10, and 7 in the revefenacin 88 μg, 175 μg, and tiotropium groups, respectively). Only 1 of these was considered related to revefenacin (atrial fibrillation in the revefenacin 175 μg group, Study 0128).

**CONCLUSION:** No increased risk of MACE was identified in clinical trials up to 52 weeks. Once-daily revefenacin of up to 1 year is associated with acceptable CV safety and, thus, may provide beneficial nebulized therapy for patients with COPD.

**292. Improving time to medication administration by piloting a cartless automated dispensing cabinet model in the surgical ICU at NYU Langone Brooklyn** *Prachi Bhatt*, *Pharm.D.*, *BCPS*, *BCCCP*[1], Elizabeth Douglas, BSN, RN, CCRN[2], Erwin Wang, MD, MHA[2], Patricia Ayoung-Chee, MD, MPH FACS[2]; [1]Department of Pharmacy, NYU Langone Hospital Brooklyn, Brooklyn, NY [2]NYU Langone Hospital Brooklyn, Brooklyn, NY

**INTRODUCTION:** NYU Langone Hospital Brooklyn is committed to continued evaluation and improvement of medication processes and workflows. A pilot of a cartless automated dispensing cabinet (ADC) system was discussed as a potential solution to provide easier bedside access to medications and decrease time to first dose administration in time sensitive diagnoses (for example, sepsis).

**RESEARCH QUESTION OR HYPOTHESIS:** What is the impact on time to first dose administration and perceived workload after implementation of an ADC in a surgical ICU?

**STUDY DESIGN:** Single center, retrospective review, quality improvement

**METHODS:** Baseline metrics on medication doses returned to pharmacy, time to medication administration, and time to order verification in the surgical ICU were analyzed using data from the electronic medical record. Additionally, a nursing satisfaction survey was conducted to evaluate workload. A pilot cartless ADC model was then implemented and metrics were evaluated.

**RESULTS:** The overall time to medication administration decreased from a pre-implementation average of 84 minutes to 55 minutes (for orders due within one hour). The percentage of orders administered within the intended one hour increased from 59% to 72%. There was a significant improvement in percentage of first dose broad spectrum antibiotics administered within one hour; from 33% to 66%. The number of doses returned to pharmacy decreased from 47% to 15%. Based on bedside nursing surveys, there has been a decrease in time spent acquiring medications from an average of 92 min per nurse per patient to 11 min per nurse per patient.

**CONCLUSION:** In an ICU without an onsite satellite pharmacy, utilizing an automated dispensing cabinet system improves several aspects of the medication delivery and administration process. Most notably, the time from order entry to administration decreased in our pilot.

**293. Pharmacoeconomic analysis of safety interventions by a pharmacist-adjudicated prior authorization consult service** Sherin Jacob, Pharm.D., BCPS, Rachel Britt, Pharm.D., BCPS, William Bryan, Pharm.D., BCPS, Jonathan Hale, Pharm.D., BCPS, Mohamed Hashem, Pharm.D., BCPS, *Jamie Brown*, *Pharm.D.*, *BCPS*, *BCACP*; Pharmacy Service, Durham VA Health Care System, Durham, NC

**INTRODUCTION:** Centralized formulary management systems are designed to encourage safe, effective, and affordable medication use. Within this system, the implementation of a pharmacist-adjudicated prior authorization drug request (PADR) consult service has the potential to further promote clinically sound, safe, and cost-effective medication therapies.

**RESEARCH QUESTION OR HYPOTHESIS:** The primary objective was to determine cost avoidance associated with pharmacist-adjudicated PADR safety interventions within a Veterans Affairs healthcare system. Secondary objectives included evaluating direct cost savings and characterizing the severity of adverse drug events (ADEs) avoided.

**STUDY DESIGN:** Retrospective chart review

**METHODS:** Pharmacist-adjudicated PADRs not approved due to a safety intervention between July 1, 2016 and June 30, 2017 were included. Cost avoidance was determined by multiplying the probability of ADE occurrence in the absence of the PADR safety intervention by the estimated cost avoided based on the type of intervention. Direct cost savings was calculated by totaling the cost of requested medications not approved for each PADR and subtracting the cost of recommended alternative therapies and cost of pharmacist PADR review. Severity estimates for avoided ADEs were also assessed. All potential ADEs avoided were reviewed by a panel of three board-certified clinical pharmacists to validate the ADE probability score, intervention type, and severity score. Descriptive statistics were used for all analyses.

**RESULTS:** Of the 910 PADRs not approved during the study period, 96 met inclusion criteria. Pharmacist-adjudicated PADR safety interventions resulted in a total cost avoidance of $24,485.33 (mean: $255.06) and a direct cost savings of $288,695.63 (mean: $3,007.25). The practice settings of anticoagulation and infectious diseases resulted in the largest contribution to cost avoidance and cost savings, respectively. ADEs avoided were classified as major for 64.6% of the PADRs.

**CONCLUSION:** Pharmacist-adjudicated PADR safety interventions resulted in substantial economic benefit and prevention of major ADEs. This analysis justifies the pharmacist's role in a centralized formulary management system to optimize medication therapy.

**294. Intravenous immunoglobulin dosing protocols in obese patients with acute versus chronic indications** *Sung Shin Na*, *Pharm.D. Candidate*[1], Mark Rusay, Pharm.D. Candidate[1], Mary Bridgeman, Pharm.D., BCPS, CGP[1], Leonid Kagan, Ph.D.[2], Luigi Brunetti, Pharm.D., MPH,

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**INTRODUCTION:** Currently, there is no standard for dosing intravenous immunoglobulin G (IVIG), a plasma-derived therapeutic, in obese patients. IVIG dosing is weight-based with published literature suggesting using adjusted body weight (AdjBW) or ideal body weight (IBW); however, dosing selection remains inconsistent and is largely based on institutional protocols.

**RESEARCH QUESTION OR HYPOTHESIS:** Is IVIG-related adverse event (AE) frequency related to dosing strategy?

**STUDY DESIGN:** Multicenter, retrospective review of electronic health records

**METHODS:** Data from 135 IVIG-treated patients were collected from two acute care hospitals with different dosing strategies. Patients were stratified into four body mass index (BMI) categories: underweight if BMI<18.5 kg/m$^2$, normal if BMI=18.5-24.9 kg/m$^2$, overweight if BMI=25-29.9 kg/m$^2$, or obese if BMI≥30 kg/m$^2$. Hospital 1 (actual body weight (ABW) dosing) included inpatients treated for acute conditions. Hospital 2 (ABW or AdjBW if ABW≥1.25 IBW dosing) included outpatients treated for chronic conditions. Infusion information was available for Hospital 2 only. The primary outcome was any IVIG-related AE. The secondary outcome was infusion-related AE frequency in obese/overweight patients. CSL Behring provided funding.

**RESULTS:** The final dataset included 134 patients. At Hospital 1, there was no significant difference between AE frequency in obese/overweight patients and normal/underweight patients (18.2% vs 22.7%, respectively, p=0.681). At Hospital 2, obese/overweight patients experienced significantly more AEs than normal/underweight patients (26% vs 6.9%, respectively, p=0.040). There was no difference in AE frequency in obese/overweight patients who exceeded the product-specific package insert-recommended maximum infusion rate versus those who did not (p=0.645).

**CONCLUSION:** The difference in AE frequency in the obese/overweight populations at Hospitals 1 and 2 suggests that the indication for therapy may influence AE frequency in obese/overweight patients as a function of greater IVIG exposure (i.e., chronic versus acute therapy). Despite reduced dose as a result of adjBW dosing of IVIG in obese/overweight patients in Hospital 2, the frequency of AE was greater in this population.

**295. Acute kidney injury in hospitalized adult patients receiving vancomycin monotherapy compared to combination therapy with piperacillin-tazobactam** Danielle Davenport, MD[1], Nicole Gonzalez, MD[1], Niki Koirola, Pharm.D.[2], Adam Froyum-Roise, MD, MPH[1], Matthew Witry, Pharm.D., Ph.D.[3], *James D. Hoehns, Pharm.D., BCPS, FCCP*[4]; [1]Northeast Iowa Family Practice Center, Waterloo, IA [2]Covenant Medical Center, Waterloo, IA [3]University of Iowa College of Pharmacy, Iowa City, IA [4]University of Iowa College of Pharmacy and Northeast Iowa Family Practice Center, Waterloo, IA

**INTRODUCTION:** Acute kidney injury (AKI) is associated with increased morbidity and mortality. Previous studies have suggested an increase in AKI with combined vancomycin and piperacillin-tazobactam (VAN+PT) administration.

**RESEARCH QUESTION OR HYPOTHESIS:** The primary endpoint was the frequency of AKI in patients receiving VAN+PT vs. vancomycin (VAN). The secondary endpoint was to evaluate predictors of AKI in patients receiving VAN+PT.

**STUDY DESIGN:** Retrospective chart review.

**METHODS:** Patients were identified from two community hospitals. Admissions occurred between January-June 2017 (hospital 1) and July-September 2016 (hospital 2). Inclusion criteria were: age ≥ 18 years, minimum of 48 hours of VAN use, pretreatment and repeat creatinine values. Patients with serum creatinine (Scr) ≥ 1.5 mg/dL, end-stage renal disease, receiving dialysis or critically ill were excluded. AKI was defined as a 1.5 times or ≥0.3 mg/dL increase in Scr. Steady state VAN trough levels were recorded. Data were collected from electronic medical record abstraction. Univariate and multivariate analyses were utilized. IRB approval was obtained.

**RESULTS:** There were 166 patients who received VAN (N=80) or VAN+PT (N=86). AKI was observed in 14.3% and 34.2% of patients, respectively (P=0.003). Patients receiving VAN were older (mean age: 64.3 (17.1) vs. 56.4 (24.5), respectively (P=0.019). In univariate analysis there was no significant difference in concomitant nephrotoxins, infection site, duration of VAN use or frequency of supratherapeutic VAN levels between the two groups. Multivariate analysis revealed the following characteristics were associated with an increased risk of AKI: use of VAN+PT (16.5% increased risk, P=0.049) and the interaction term of VAN+PT use plus supratherapeutic VAN level (68% increased risk, P=0.001).

**CONCLUSION:** VAN+PT compared to VAN is associated with an increased risk of AKI. Patients receiving combination VAN+PT with a supratherapeutic VAN level are at especially high risk of AKI. Patients receiving VAN+PT may warrant additional therapeutic drug monitoring to ensure appropriate VAN dosing.

**296. Implementation of criteria to predict medication-related readmissions within high-risk patients** *Belinda Mang, Pharm.D., BCPS*[1], Kristin Alvarez, Pharm.D., BCPS[2], Kristy Vo, Pharm.D., BCPS[2]; [1]Pharmacy, CareMore, Fort Worth, TX [2]Pharmacy Department, Parkland Hospital, Dallas, TX

**INTRODUCTION:** The Transitional Care Unit (TCU) program is designed to identify high-risk patients to improve access to care, promote engagement, and reduce 30-day readmissions. At discharge, pharmacist performs a comprehensive assessment of medications, reconciles discrepancies, and provides extensive counseling. To balance the value of this service with limited resources, a risk stratification was developed to classify patients as high-, moderate-, or low-risk for medication-related readmissions, correlating with pharmacist intervention.

**RESEARCH QUESTION OR HYPOTHESIS:** Determine if implementation of a risk stratification and pharmacist intervention have an impact on 30-day medication-related readmission rates.

**STUDY DESIGN:** Retrospective, descriptive study

**METHODS:** Patients in the TCU program who received pharmacist intervention post-implementation between October and December 2017 were included. The 30-day readmissions were reviewed for primary diagnosis, contribution of medication-related problems, and readmission setting (inpatient, observation, or ED/UCC). Descriptive statistics were used for baseline characteristics and outcomes.

**RESULTS:** Three-hundred and sixty-three patients were eligible with most patients categorized as high-risk (68.3%) and receiving pharmacist intervention, followed by moderate- (19.3%) and low-risk (12.4%). Overall, 42 (11.6%) were inpatient readmissions within 30 days and 21 were associated with a medication, resulting in a medication-related readmission rate of 5.8%. This was primarily driven by the high-risk (6.9%) group as compared to moderate- (4.3%) and low-risk (2.2%) groups, with 66.7% due to noncompliance. No discernable trend was seen in the observation and ED/UCC revisits, with 2.4%, 1.4%, and 2.2% revisit rates in the high-, moderate-, and low-risk groups, respectively, despite an all-cause revisit rate of 9.1%.

**CONCLUSION:** Our findings suggest that risk categorization may predict medication-related readmissions as observed by down-trending readmission rates. While greater readmissions were observed in the high-risk group, no control group was available to compare the impact of pharmacist intervention. This data provides a foundation to continue developing more robust stratification processes to enhance pharmaceutical interventions aimed at achieving and sustaining positive outcomes.

## NEPHROLOGY

**297. Estimation of renal function for drug dosing: a national survey of pharmacist** *Sean McConachie, Pharm.D., BCPS*[1], Sheila Wilhelm, Pharm.D., FCCP, BCPS[2], Joshua Raub, Pharm.D., BCPS[3], Claudia Hanni, Pharm.D.[4]; [1]Eugene Applebaum College of Pharmacy & Health Sciences, Wayne State University, Detroit, MI [2]Department of Pharmacy Practice, Wayne State University, Eugene Applebaum College of Pharmacy & Health Sciences, Detroit, MI [3]Detroit Receiving Hospital, Detroit, MI [4]Harper University Hospital, Detroit, MI

**INTRODUCTION:** Creatinine-based equations used to estimate renal function are inaccurate in certain clinical contexts, but there is limited literature to guide pharmacists in these situations.

**RESEARCH QUESTION OR HYPOTHESIS:** Inconsistent estimation of renal function among pharmacists impacts drug dosing, causing variation in pharmacotherapy.

**STUDY DESIGN:** A national electronic survey was distributed to capture current renal function estimation and subsequent drug dosing practices.

**METHODS:** A 23-item survey was emailed to the listservs of four ACCP Practice-Research Networks: Adult Medicine, Nephrology, Critical Care, and Infectious Diseases. The survey included pharmacist demographics, practice site information, and case-based clinical application scenarios requiring the respondent to choose a renal function estimate for overweight, underweight, and elderly patients (≥65 years). Four patient cases captured respondents' enoxaparin dosing decisions in patients with estimated creatinine clearance (CrCl) around 30 mL/min. Estimates were provided based on Cockcroft-Gault (C-G), Modified Dosing in Renal Disease (MDRD), and Chronic Kidney Disease Epidemiology (CKD-EPI) equations.

**RESULTS:** There were 296 responses to the survey. The majority of respondents were pharmacists (99%) who practiced in the hospital setting (96%) as clinical specialists (68%). The C-G equation was chosen to estimate renal function most commonly (87%). Total and adjusted body weight were used in C-G estimates most commonly in patients who were underweight (80%) and overweight (76%), respectively. Given an elderly patient with a low serum creatinine (SCr), 33% of respondents used actual SCr, 29% rounded SCr to 0.8, and 29% rounded SCr to 1.0 for use in C-G. Enoxaparin renal dose adjustment differed based on clinical indication. Respondents chose more aggressive (q12hr) dosing in patients with pulmonary embolism versus atrial fibrillation. Of the 80% of respondents whose practice site utilizes pharmacist-driven renal dose adjustment policies, 94% indicate they deviate from the policy.

**CONCLUSION:** Large variation exists among clinical pharmacists in the application of renal function estimating equations which may impact dosing strategies and patient care.

**298. Influence of less-intensive vs. intensive continuous renal replacement therapy on cefepime antibiotics exposure in critically ill patients** *Soo Min Jang, Pharm.D.*[1], Alex Shaw, Pharm.D.[2], Bruce Mueller, Pharm.D.[3]; [1]Department of Pharmacy Practice, Loma Linda University School of Pharmacy, Loma Linda, CA [2]Ascend Therapeutics, Herndon, VA [3]Department of Clinical Pharmacy, University of Michigan College of Pharmacy, Ann Arbor, MI

**INTRODUCTION:** The VA/NIH ATN trial compared less-intensive (LI) vs. intensive (I) continuous renal replacement therapy (CRRT) to determine whether intensive CRRT effluent rate affected patient outcomes. However, antibiotic dosing in both treatment arms was the same regardless of CRRT effluent rates. This may result lower antibiotic exposure in patients with higher CRRT drug clearance. The purpose of this study was to determine probability of target attainment (PTA) over 72 hours of therapy for cefepime; and to evaluate the influence of intensity of effluent rates for cefepime in different pharmacodynamic (PD) targets.

**RESEARCH QUESTION OR HYPOTHESIS:** Critically ill patients receiving intensive CRRT will attain lower PTA compared patients receiving LI CRRT.

**STUDY DESIGN:** Monte Carlo Simulations (MCS)

**METHODS:** Previously published pharmacokinetic from critically ill patients and/or receiving CRRT and demographic data from the ATN trial were used to perform MCS in 10,000 virtual patients. Published cefepime dosing regimens were applied: 1g q12h, 1g q8h, 2g q12h and 2g q8h. The MCS accounted for the %prescribed CRRT dose delivered. PTA was calculated using PD targets of ≥60% free serum concentrations above the minimum inhibitory concentration of 8 mg/L (≥60% fT>MIC), ≥% fT>4×MIC, and ≥100%fT>MIC for the first 72 hours of antibiotic therapy.

**RESULTS:** The PTAs for 1×MIC were: 1g q12h (LI-100%; I-99.9%) and PTA of 100% for all other regimens in both arms. The PTAs for 4×MIC were: 1g q12h (LI-7.8%; I-2.3%), 1g q8h (LI-57.4%; I-33%), 2g q12h (LI-86.5%; I-77.2%) and 2g q8h (LI-100%; I-99%). The PTAs for 100%fT>1×MIC were: 1g q12h (LI-10.8%; I-8.4%), 1g q8h (LI-15.5%; I-15.6%), 2g q12h (LI-56.3%; I-55.2%) and 2g q8h (LI-57%; I-56.9%).

**CONCLUSION:** Regardless of pharmacodynamic target chosen, the difference in PTA between high and low intensity CRRT is usually less than 5%.

**299. Factors associated with increased hospital length of stay in peritoneal dialysis patients presenting with peritonitis: a need for antimicrobial stewardship?** *Taylor Morrisette, Pharm.D.*[1], Robert Canada, MD[2], Danielle Padgett, Pharm.D., BCPS[3], Joanna Hudson, Pharm.D., BCPS, FASN, FCCP[4]; [1]Department of Pharmacy, University of Colorado Hospital and Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO [2]Department of Medicine (Nephrology), The University of Tennessee, Memphis, TN [3]Department of Pharmacy, Methodist University Hospital, Memphis, TN [4]Department of Clinical Pharmacy and Medicine (Nephrology), The University of Tennessee, Memphis, TN

**INTRODUCTION:** Peritonitis remains a common complication of peritoneal dialysis (PD) and contributes significantly to morbidity. Adherence with evidence-based recommendations is expected to resolve peritonitis within five days; however, hospital length of stay (LOS) for patients with PD-associated peritonitis (PDAP) is often prolonged. Factors contributing to increased LOS and vigilance with antimicrobial stewardship (ASP) in this population are not well described.

**RESEARCH QUESTION OR HYPOTHESIS:** What factors are associated with increased LOS in patients with PDAP?

**STUDY DESIGN:** System-wide, retrospective cohort of adult patients presenting with PDAP to Methodist Le Bonheur Healthcare from August 2012 to August 2017.

**METHODS:** Patients were divided into two groups based on LOS: < 7 days (reduced LOS) versus ≥ 7 days (prolonged LOS). Patient demographics, adherence to guideline-based recommendations for antimicrobial therapy, appropriate de-escalation of antimicrobials, resolution of peritonitis by day five, blood glucose, admission to the intensive care unit (ICU), infectious diseases (ID) consultation, changes in dialysis modality, and pathogen characteristics were compared. In-hospital mortality and 30-day readmissions were also evaluated.

**RESULTS:** Of 401 patients screened, 90 met inclusion criteria: 53% female, 88% African-American, age 52 ± 2 years, with 46 in the reduced LOS group and 44 in the prolonged LOS group. Factors associated with increased LOS were: admission to ICU (p=0.014), ID consultation (p=0.015), removal of PD catheter (p=0.001), switching to hemodialysis (p<0.001), concomitant anti-fungal therapy (p=0.021), and number of days with blood glucose readings >180 mg/dL. An opportunity for antimicrobial de-escalation was identified in 24 (52%) and 22 (50%) patients in the reduced and prolonged LOS groups, respectively; however, de-escalation occurred in only 5 (21%) and 6 (27%) of these patients. There were no differences in mortality or 30-day readmissions.

**CONCLUSION:** Longer LOS was influenced by acuity of illness and not type or resolution of infection. There is a need to improve ASP within the PDAP population.

**300. The impact of a pharmacist-managed epoetin alpha dosing and monitoring service for hospitalized chronic kidney disease (CKD) patients at an academic medical center** *Syed Samad, Pharm.D. Candidate*[1], Kimberly Zammit, Pharm.D., BCPS, BCCCP, FASHP[2], Calvin Meaney, Pharm.D., BCPS[3]; [1]Department of Pharmacy Practice, UB School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY [2]Department of Pharmacy Practice, Buffalo General Medical Center, Buffalo, NY [3]Department of Pharmacy Practice, University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY

**INTRODUCTION:** Hypo-responsiveness of acutely ill CKD patients to erythropoietin stimulating agents (ESAs) leads to overuse of ESA therapy. There is no information evaluating the impact of a pharmacist managed ESA dosing protocol in hospitalized patients on ESA utilization and patient outcomes.

**RESEARCH QUESTION OR HYPOTHESIS:** Management of ESA therapy during an inpatient admission with a pharmacy-to-dose (PTD) protocol will result in no significant difference in the percent change in hemoglobin at discharge compared to provider driven dosing. Secondarily, the PTD protocol will result in lower weekly epoetin alpha doses based on body weight.

**STUDY DESIGN:** A single center, retrospective before and after study.

**METHODS:** Patients with CKD stage IV and V receiving ESA therapy prior to hospital admission were compared before and after implementation of a pharmacist-managed dosing protocol. Data collected included baseline demographics, total ESA dose, number of dose escalations, hemoglobin change, blood transfusions, and patient outcomes. Hypothesis testing was used as appropriate with SPSS with an alpha set at 0.05.

**RESULTS:** A total of 100 patients were assessed for the primary endpoint, n=50 per group. There was no statistically significant difference in age, weight, BMI, iron supplementation, or bleeding between the two groups. The primary endpoint for the pre-PTD group was not statistically significant 1.123% versus 1.798% (p = .521). In the pharmacy protocol group, patients had a lower total epoetin alpha dose of 186 vs 348 u/kg/week respectively (p< 0.001) and fewer dose increases (p= 0.029). Patients in the PTD group received fewer blood transfusions 1.32 vs 2.14 (p= 0.048). The presence of bleeding or administration of blood transfusions did not influence the primary endpoint.

**CONCLUSION:** A pharmacist-to-dose epoetin alpha protocol was associated with lower doses (u/kg/week) and dose increases with no statistically significant change in the percent difference of hemoglobin during patients' hospital course.

**301. Contrast induced nephropathy: comparison of agents and definitions** *Calvin Meaney, Pharm.D., BCPS*[1], Kelly Krieger, Pharm.D.[2],

Kimberly Zammit, Pharm.D., BCPS, BCCCP, FASHP[3]; [1]Department of Pharmacy Practice, University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY [2]University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY [3]Department of Pharmacy, Buffalo General Medical Center, Buffalo, NY

**INTRODUCTION:** Data are conflicting on the differential nephropathy risk between iohexol (low-osmolar) and iodixanol (iso-osmolar) contrast agents. Previous trials included specific at-risk populations with various definitions of contrast-induced nephropathy (CIN) and are difficult to compare.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the cumulative incidence of CIN between iohexol and iodixanol in a heterogeneous, real-world population? Secondarily, how do different definitions of CIN influence study results?

**STUDY DESIGN:** Retrospective cohort

**METHODS:** Patients undergoing percutaneous coronary intervention (PCI) that received intravenous iohexol or iodixanol and had renal function data available for 72 hours were included. Exclusion criteria were dialysis dependence and acute kidney injury on presentation. CIN was defined as: [1]serum creatinine (SCr) increase by 0.3mg/dL or 50% above baseline within 48-hours (AKIN stage-1), [2]estimated glomerular filtration rate (eGFR) decrease by 25% within 72 hours, [3]SCr increase by 25% within 72 hours, [4]SCr increase by 0.5 mg/dl, and [5]RIFLE criteria. Multivariable logistic regression was used to compare CIN between iohexol and iodixanol with covariate analysis using SAS v9.4 with alpha=0.05.

**RESULTS:** The 400 included patients were 65.9±12.7 years old, 60.3% male, 85% Caucasian, and received a median 190mL of contrast. Baseline eGFR was 75.3±26.8ml/min/1.73m$^2$. CIN by definition-1 occurred in 67 (18%) on iohexol compared to 7 (25.9%) on iodixanol (P=0.307). After adjustment for heart failure, diabetes mellitus, baseline renal function, and concomitant nephrotoxins, there was no difference in CIN between iohexol and iodixanol (adjusted odds ratio 0.67, 95% CI 0.24-1.58, P=0.319). In the overall cohort, the incidence of CIN ranged 10%-21% depending on the definition (P=0.0005). Definition-3 showed a non-significant trend toward increased CIN with iodixanol (P=0.09).

**CONCLUSION:** There is no difference in the risk of CIN between iohexol and iodixanol in a real world population undergoing PCI. This should be confirmed in a controlled prospective study with balance inclusion. The definition of CIN is critical to interpretation of study results.

**302. Comparison of kidney function estimates for drug dosage adjustments** *Sheryl Vondracek, Pharm.D.*[1], Barbara Brenneman, BS[2], Garth Wright, MPH[1], Toral Patel, Pharm.D.[1]; [1]Department of Clinical Pharmacy, University of Colorado, Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO [2]School of Pharmacy and Pharmaceutical Sciences, University of Colorado, Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

**INTRODUCTION:** The National Kidney Foundation recommends individualized Modification of Diet in Renal Disease ($MDRD_{ind}$) or Chronic Kidney Disease Epidemiology Collaboration ($CKD\text{-}EPI_{ind}$) equations for drug dosing, not Cockcroft-Gault (CG). However, the original CG equation and modified versions are still used by many institutions, including the University of Colorado Hospital (UCH), which uses weight and serum creatinine (Scr) adjustments.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the drug dosing discordance between the UCH-CG and the other estimation equations?

**STUDY DESIGN:** Prospective, observational

**METHODS:** Single point in time data was collected on adult patients with a creatinine clearance (CrCl) <50 mL/min (UCH-CG), stable Scr, and ≥1 medication on the UCH Pharmacy Renal Dosing Protocol. Primary outcome was a comparison of the percent discordant dosing recommendations using McNemar's Test with Bonferroni correction. Secondary outcomes were a comparison of the differences in CrCl or glomerular filtration rate (GFR) from each equation using the Wilcoxon Signed Rank test with Bonferroni correction and predictors of discordance using logistic regression.

**RESULTS:** One hundred ninety-six patients receiving 283 protocol drugs were included. Mean ± SD age was 72.7±11.1 years, 67% were female, and 31% obese. Mean ± SD kidney function estimate using the UCH-CG equation was significantly lower compared to the other equations (UCH-CG: 39±9 ml/min versus CG: 49±18 ml/min, CKD-Epi: 52±23 ml/min/1.73m$^2$, $CKD\text{-}Epi_{ind}$: 51±18 ml/min, MDRD: 56±32 ml/min/1.73m$^2$, $MDRD_{ind}$: 54±27 ml/min, p<0.001). Dosing discordance between UCH-CG and CG, CKD-EPI, $CKD\text{-}EPI_{ind}$, MDRD, $MDRD_{ind}$ was 22%, 28%, 25%, 29%, and 26%, respectively. Approximately 90% of the discordant doses were higher. The CG equation was less discordant than the MDRD and CKD-EPI equations (p<0.0125). Females were 2 times more likely (p<0.046-0.018) and patients with a Scr <0.8 were 5-7 times more likely (p<0.0001) to have discordant dosing recommendations.

**CONCLUSION:** The UCH-CG equation resulted in a significantly lower kidney function estimate and different dosage recommendations approximately 25% of the time versus other equations.

**303. Evaluation of thrombosis during hemodialysis in end-stage renal disease (ESRD) patients receiving subcutaneous heparin** *Chelsea Mitchell, Pharm.D.*[1], Benjamin Duhart, MS, Pharm.D.[2], Carrie Oliphant, Pharm.D., FCCP, BCPS-AQ Cardiology, AACC[3], Leonette Kemp, Pharm.D.[4], Joanna Hudson, Pharm.D., BCPS, FASN, FCCP[5]; [1]Methodist University Hospital, Memphis, TN [2]Department of Clinical Pharmacy, University of Tennessee College of Pharmacy, Memphis, TN [3]Department of Pharmacy, Methodist University Hospital, Memphis, TN [4]The University of Tennessee College of Pharmacy, Methodist University Hospital, Memphis, TN [5]Department of Clinical Pharmacy and Medicine (Nephrology), The University of Tennessee, Memphis, TN

**INTRODUCTION:** End-stage renal disease (ESRD) patients requiring hemodialysis (HD) are at risk for thrombosis of their access site and the dialysis circuit. While administration of systemic unfractionated heparin (UFH) through the HD circuit is routine to prevent thrombosis

in the outpatient setting, practices vary in the inpatient setting. Our institution employs a heparin-free policy for all HD inpatients; however, many receive subcutaneous UFH for venous thromboembolism (VTE) prophylaxis.

**RESEARCH QUESTION OR HYPOTHESIS:** Is UFH given for VTE prophylaxis associated with less thrombosis during HD?

**STUDY DESIGN:** Retrospective cohort study

**METHODS:** ESRD patients who received at least two HD treatments during hospitalization were identified. Patients newly initiated on HD, admitted with a clotted dialysis access site, or receiving new access were excluded. Patients were categorized based on whether they received UFH for VTE prophylaxis during hospitalization. The percentage of patients experiencing thrombosis was compared between groups. UFH dosing regimens, interventions for thrombosis, length of stay (LOS), dialysis conditions, and antiplatelet use were also compared.

**RESULTS:** A total of 170 patients were included: 49% male, 91% African-American, mean age 56±15 years, with 72 in the control group and 98 in the UFH group. The mean UFH dose was 5000 Units with twice daily dosing in 69 patients and three times daily in 29 patients. Thrombotic events during HD occurred in 13% of control patients and 21% of UFH patients; however, this difference was not statistically significant. An equal frequency of clotting events required temporary discontinuation of HD in both groups, but a higher rate of administration of thrombolytic agents and discontinuation of HD was observed in the UFH group. There were no differences in LOS among those experiencing a clotting event.

**CONCLUSION:** The receipt of subcutaneous UFH for VTE prophylaxis did not reduce the occurrence of thrombotic events in ESRD patients on HD.

## NEUROLOGY

**304. Pharmacist role in managing patients with multiple sclerosis**

*Jennifer Cardone, Pharm.D.*[1], Paul Isikwe, Pharm.D.[1], Lisa Farnett, Pharm.D.[2], Darren Stam, Pharm.D.[2]; [1]MCPHS University, Boston, MA [2]Sanofi Genzyme, Cambridge, MA

**INTRODUCTION:** There is limited contradictory data published regarding the role of pharmacists in managing patients with multiple sclerosis (pwMS). Some studies refer to leveraging the pharmacist-patient relationship in pharmacy-led monitoring[1-4]. Additional data describes a lack of relationship between patient compliance/persistence and access to pharmacist care[5]. This indicates an unmet need for evidence elucidating current trends in the role of pharmacists in managing pwMS.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the role of pharmacists in managing pwMS?

**STUDY DESIGN:** This was a non-randomized, anonymous, electronic survey of clinical pharmacists.

**METHODS:** A survey was distributed via email to members of the American College of Clinical Pharmacy ambulatory care, adult medicine, and central nervous system (CNS) Practice and Research Networks (PRNs). Participants provided informed consent. Responses were analyzed using percentages to determine the most frequent responses and distribution of responses.

**RESULTS:** N=24 responses, mean 15 (all from CNS PRN) per question. Common practice sites were inpatient hospitals, academic centers, and Veterans Affairs medical centers, and 93% trained pharmacy students/residents. 41% had collaborative practice agreements. 76% did not bill for services. 65% did see pwMS, often by patient or referral appointment, or during medication dispensing. Patient interactions were often >30 minutes, and included discussion of various topics. As an integral part of the healthcare team, respondents reported recommending changes to disease modifying therapy (DMT) (56%) and provided rationale for switching DMT (side effects, cost and access, lack of efficacy) Respondents also reported monitoring patients comprehensively (75%), and managing MS symptoms (81%) (fatigue, spasticity, movement/gait disorders). Respondents interacted primarily with neurologists, MS specialists, and advanced practice clinicians and nurses.

**CONCLUSION:** Clinical pharmacists across practice settings are extensively involved in managing pwMS. As the number of DMTs expands and individualizing disease management becomes more complex, MS practice settings may offer an expanding role for pharmacy practice.

**305. The study of pharmacist's knowledge about adverse drug reactions of sodium valproate in reproductive women patients**

*Thanarat Suansanae, BSc (Pharm), BCPP, BCGP* and Busba Chindavijak, BSc (Pharm), Ph.D.; Department of Pharmacy, Faculty of Pharmacy, Mahidol University, Bangkok, Thailand

**INTRODUCTION:** Valproate posses teratogenicity and should be cautioned when using in reproductive-aged women with epilepsy.

**RESEARCH QUESTION OR HYPOTHESIS:** The objective of this study was to evaluate knowledge of hospital pharmacist about adverse drug reactions of sodium valproate in reproductive-age women with epilepsy.

**STUDY DESIGN:** Survey study was conducted.

**METHODS:** Fifteen-items questionnaire was developed from KOWIE-II and was evaluated by experts. The questionnaires were send directly to hospital pharmacists who were working in University hospitals, hospitals of the Department of Medical Services, hospitals of Bangkok Metropolitan Administration and private hospitals by coordinators in each 8 hospitals.

**RESULTS:** The results revealed that 375 questionnaires could be collected (75.4% of targeted hospital pharmacists). Most of participants were women (81.1%), aged <35 years old (81.6%), working experience <5 years (63.5). Most of them were working in University hospitals (42.4%) while 11.2%, 11.7% and 34.7% were working in hospitals of the Department of Medical Services, hospitals of Bangkok Metropolitan Administration and private hospitals, respectively. Major of them worked at dispensing unit and had experience to dispense sodium valproate (58.9%). The mean score was 8.00±3.56. Highest correct item (89.4%) was asking about using of sodium valproate during

pregnancy and risk of teratogenicity. The least correct item (16.4%) was related to drug interaction between sodium valproate and oral contraceptives. Pharmacists who had experience to dispense sodium valproate had statistically significant higher score than who had not (8.22 and 7.35, respectively, p=0.03).

**CONCLUSION:** This study showed that hospital pharmacists had low to moderate knowledge about adverse drug reactions of sodium valproate in reproductive-age women with epilepsy which might affect appropriateness of patient counseling and pharmaceutical care.

**306E. Long-term safety and tolerability of valbenazine in participants with tardive dyskinesia** *Jack Chen, Pharm.D.*[1], Gary Remington, MD, Ph.D., FRCPC[2], Cynthia Comella, MD[3], Joshua Burke, MS[4], Khodayar Farahmand, Pharm.D.[4], Scott Siegert, Pharm.D.[4]; [1]American University of Health Sciences, Signal Hill, CA [2]Centre for Addiction and Mental Health, Toronto, ON, Canada [3]Rush University Medical Center, Chicago, IL [4]Neurocrine Biosciences, Inc., San Diego, CA

Presented at the College of Psychiatric and Neurologic Pharmacists Annual Meeting, Indianapolis, Indiana, April 22-25, 2018.

**307E. Focal epilepsies and photoparoxysmal responses: ethnic influence?** *Ronald Reed, BS Pharm, Pharm.D., FCCP, FAES*[1], Dorothee Kasteleijn-Nolst Trenite, MD, Ph.D., MPH[2]; [1]Department of Clinical Pharmacy, School of Pharmacy, West Virginia University, Morgantown, WV [2]Department of Neurosurgery & Epilepsy, University Medical Center Utrecht, Utrecht, Netherlands

Presented at the 71st Annual Meeting of the American Epilepsy Society (AES), Washington, DC., December 1–5, 2017.

**308E. Risk-benefit hemorrhagic analysis of TPA administration post ischemic stroke** *Shima Shafiyan, Pharm.D. Candidate*[1], Ahmed Zaki, Pharm.D. Candidate[2], Amne Borghol, Pharm.D., BCPS[3]; [1]College of Pharmacy, Xavier University of Louisiana, New Orleans, LA [2]College of Pharmacy, Xavier University of Lousiana, New Orleans, LA [3]College of Pharmacy, Division of Clinical and Administrative Sciences., Xavier University of Louisiana, New Orleans, LA

Presented at the Louisiana Society of Health-System Pharmacists Annual Conference, New Orleans, LA, May 24-26, 2018.

## NUTRITION

**309E. Obesity attenuates serum 25-OH vitamin D response to cholecalciferol therapy in critically ill patients** Whitney Holmes, Pharm.D.[1], Malcolm Earle, Pharm.D. student[2], George Maish III, MD[3], Gayle Minard, MD[3], Martin Croce, MD[3], *Roland Dickerson, Pharm.D.*[2]; [1]Department of Pharmacy, Regional One Health, Memphis, TN [2]Department of Clinical Pharmacy and Translational Science, University of Tennessee College of Pharmacy, Memphis, TN [3]Department of Surgery, University of Tennessee Health Science Center, Memphis, TN

Presented at the American Society for Parenteral and Enteral Nutrition 2018 Nutrition Science & Practice Conference. Las Vegas, NV, January 23, 2018.

**310. Potential cost savings of eliminating avoidable parenteral nutrition use in adult hospitalized patients at an academic medical center** *Haley Kavelak, Pharm.D., BCCCP*[1], James Hollands, Pharm.D., BCPS-AQ Cardiology[2], Justin Delic, Pharm.D., BCCCP[2], Cory Angelini, MBA[3], Angela Bingham, Pharm.D., BCPS, BCNSP, BCCCP[2]; [1]St. Luke's University Health Network, Bethlehem, PA [2]Department of Pharmacy Practice and Pharmacy Administration, University of the Sciences-Philadelphia College of Pharmacy, Philadelphia, PA [3]Cooper University Hospital, Camden, NJ

**INTRODUCTION:** Parenteral nutrition (PN) is a potentially lifesaving therapy when indicated, but judicious selection of candidates is a challenge for many institutions.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the potential annual cost savings associated with avoidable PN in adult hospitalized patients at an academic medical center?

**STUDY DESIGN:** Single center, retrospective analysis.

**METHODS:** Adult hospitalized patients receiving PN from April 1, 2015 to March 31, 2016 were included. PN appropriateness was assessed for each patient encounter based on guidance from the American Society for Parenteral and Enteral Nutrition. Categories for avoidable PN use included: inadequate enteral nutrition attempts, short course (<7 days), early initiation (earlier than 7 days unless malnourished), functional gastrointestinal (GI) tract, prolonged course (after return of GI function), and patient-directed (refused enteral nutrition). Waste was defined as PN that was ordered and compounded, but not administered. Avoidable PN and waste charges were determined by multiplying days by the mean institutional charge for PN product ($80/day). Complications were assessed for avoidable PN encounters. Descriptive statistics were used for analysis.

**RESULTS:** There were 419 patient encounters [floor (70%), medical ICU (16.7%), trauma ICU (10.3%), cardiac ICU (3.1%); in-hospital mortality: 11.5%; mean hospital length of stay: 22 days; mean duration of PN per encounter: 11 days; central PN: 95%]. There were 258 patient encounters (62%) with avoidable PN, which accounted for 2,254 avoidable PN days ($180,320). The most common categorization for avoidable PN included short course (52%) and early initiation (41%). Waste occurred on 149 days and contributed $11,920 in direct costs. The total annual direct costs associated with avoidable PN and waste in adult hospitalized patients is $192,240. Avoidable PN encounters accounted for complications [metabolic (n=153); infectious (n=26); mechanical (n=7)].

**CONCLUSION:** Avoidable PN use and waste in adult hospitalized patients is associated with significant cost expenditures and increases the burden of metabolic, infectious, and mechanical complications.

## ONCOLOGY

**311. Extending the use of doxorubicin in chemotherapy through the use of natural products** *Arthur Nguyen, BS*[1], Karen Seo, N/A[1], Max Lee, BS[1], Deepa Rao, BS[1]; [1]Pacific University, Hillsboro, OR

**INTRODUCTION:** Doxorubicin (DOX), an anticancer agent, acts through inhibition of topoisomerase 2 and formation of reactive oxygen species. The same mechanisms are responsible for its cardiotoxicity which limits is use to 450-550 mg/m$^2$ with subclinical cardiotoxicity possible at 250 mg/m$^2$. Polyphenols such as resveratrol (R), quercetin (Q), and curcumin (C) are free radical scavengers and known chemosensitizers. Combining these natural products with DOX as a therapeutic strategy may mitigate DOX's cardiotoxicity while preserving its potency.

**RESEARCH QUESTION OR HYPOTHESIS:** We hypothesize that using R:Q:DOX at 10:10:1 (RQD), R:C:DOX 10:2:1 (RCD), and R:Q:C:DOX at 10:10:2:1 (RQCD) ratios will be synergistic in prostate (PC-3) and ovarian (SKOV-3) cells while being antagonistic in cardiomyocytes.

**STUDY DESIGN:** Quantitative cell based assay to assess potency of DOX and natural products and evaluate the degree of interaction for combinations.

**METHODS:** Cancer cells and cardiomyocytes are seeded in 96 well plates, allowed to attach for 24 hours and treated with individual or combinations at 0.01-1000 uM for 48 hours (n=4). Cell viability is assessed using CellTiterBlue by fluorescence 560nm$_{EX}$/590nm$_{EM}$. The concentration of individual and combinations needed to kill 50% of the cells ($IC_{50}$ value) is calculated using GraphPad Prism. Interaction is assessed using combination index (CI) analysis, with CI values<1, 1, and >1 being synergistic, additive, and antagonistic respectively.

**RESULTS:** In all the cell lines tested DOX has the highest potency. In the cancer cells, the RQD, RCD, and RQCD combinations are synergistic with CI values < 1. In the cardiomyocytes, the combinations are antagonistic with CI values >1.

**CONCLUSION:** Based on our results, our approach has the potential to increase the lifetime dose limit of DOX in patients while protecting them from cardiomyopathy, one of DOX's most adverse side effects.

**312. Determination of clinical factors associated with symptom burden in early-stage breast cancer patients: a latent class-analysis (LCA)** *Alexandre Chan, Pharm.D., MPH, FCCP, FISOPP, BCPS, BCOP*, Yi Long Toh, BScPharm(Hon); Department of Pharmacy, National University of Singapore, Singapore, Singapore

**INTRODUCTION:** Given the vast heterogeneity of symptoms experienced by breast cancer patients, it is of interest to evaluate whether it is possible to profile patients based on their symptom burden levels.

**RESEARCH QUESTION OR HYPOTHESIS:** This study aimed to profile symptom burden levels among early-stage breast cancer patients, and to identify the relevant factors associated with high symptom burden.

**STUDY DESIGN:** This is a multicenter, prospective, cohort study.

**METHODS:** Early-stage breast cancer (Stages 1 to 3A) patients receiving anthracycline-based or taxane-based chemotherapy were recruited. Patients' symptom burden was longitudinally assessed using the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire at six time points over the course of chemotherapy and survivorship. Latent class analysis (LCA) was utilized to assign each patient to a respective subclass, and the optimal number of classes was determined based on the Bayesian Information Criterion value. Multinomial logistic regression was conducted to determine the clinical determinants that distinguished the various subclasses.

**RESULTS:** A total of 196 patients were included (mean age ± SD= 51.8± 9 years), with 65.3% receiving anthracycline-based chemotherapy. Fatigue, pain and insomnia were the most prevalent symptoms reported by patients. Three symptom profiles of patients were classified: 48.5% with low symptom burden, 39.3% with moderate symptom burden, and 12.2% with high symptom burden. Patients with high symptom burden were more likely to be diagnosed with Stage III cancer (OR = 3.50, 95% CI = 1.17-10.49), age< 55 years (OR = 3.85, 95% CI = 1.33-11.1) and receipt of higher level of education (OR = 3.27, 95% CI = 1.28-8.36).

**CONCLUSION:** Our findings suggest that LCA is feasible to profile chemotherapy-receiving patients based on symptom level. This provides a promising strategy to guide symptom management interventions in patients with different levels of symptom burden.

**313. Institutional evaluation of chemotherapy and monoclonal antibody dose rounding policies** *Laura Roccograndi, BS*, Cali Cerami, BS and Leticia Villela Smith, Pharm.D., BCOP; Seton Healthcare Family, Austin, TX

**INTRODUCTION:** Drug waste minimization is an effective strategy to reduce waste of expensive Oncology medications. Currently, Seton Healthcare Family (SHF) utilizes a dose rounding policy to the nearest vial size for any single use vial within 5% for chemotherapy and 10% for monoclonal antibodies of the calculated dose. Prescriber request to expand the dose rounding percentage for chemotherapy to 10% requires assessment of current policy compliance and dose rounding clinical scenarios.

**RESEARCH QUESTION OR HYPOTHESIS:** How chemotherapy and monoclonal antibody doses are 1) rounded to the nearest vial size for metastatic and non-metastatic patients and 2) compliant with our rounding policies.

**STUDY DESIGN:** Retrospective cohort study preformed via chart review.

**METHODS:** Medical records of 176 cancer patients seen between June 1 and December 31, 2017 in 5 sites within SHF were reviewed. Patients' infusion orders, weight, height, indication, vial selection and pharmacy dosing interventions were documented.

**RESULTS:** Patients with metastatic disease (n=131) and non-metastatic disease (n=45) were assessed. Patients received chemotherapy (n=96), monoclonal antibodies (n=42) or both (n=38). 75 patients treated for metastatic disease had a chemotherapy dose automatically

rounded, of which 57% had doses rounded up. In non-metastatic disease, 63% (n=18) of patients had a dose rounded down. Overall policy compliance per patient for our chemotherapy dose rounding was 54% (n=72). For monoclonal antibodies, 65 patients treated for metastatic disease had a dose automatically rounded, of which 58% had doses rounded up. In non-metastatic disease, 70% (n=7) of patients had a dose rounded down. Overall policy compliance per patient for our monoclonal antibodies dose rounding was 75% (n=60). For all indications and anticancer agents, pharmacists intervened in 24% of rounded infusion orders.

**CONCLUSION:** Although our academic medical center has adopted dose rounding policies, measures to improve our compliance of these policies are warranted. Due to our review, we recommend maintaining current cutoffs and reviewing policies with prescribers and pharmacists.

**316. Using pharmacist-driven clinical oncology pathways to increase cost-effective treatment decisions** *Brandon Chang, Pharm.D.*, Timothy Mok, Pharm.D., Andrea Chan, Pharm.D.; Kaiser Permanente, San Diego, CA

**INTRODUCTION:** The advent of newer immunologics and chemotherapeutics inevitably brings greater financial burden to our healthcare system. Improvement measures are needed to overcome this financial challenge and ensure that the most cost-effective agents are used while maintaining the highest quality. This has led to the use of clinical pathways by healthcare organizations to improve patient outcomes and control costs. These clinical pathways often require a deep understanding of pharmacologic therapies, so oncology trained pharmacists are in a prime position to develop, implement, and assess them.

**RESEARCH QUESTION OR HYPOTHESIS:** Are recommendations based on clinical oncology pathways accepted by oncologists and do they reduce cost?

**STUDY DESIGN:** This is a retrospective, descriptive study that examined the pilot implementation of a pharmacist-driven clinical pathway.

**METHODS:** This is a retrospective, descriptive study that examined the pilot implementation of a pharmacist-driven clinical pathway. Oncology pharmacists at Kaiser Permanente San Diego developed clinical pathways and evaluated treatment regimens for new consult and current patients. This study will analyze the clinical pathway recommendations accepted by oncology providers and the cost-avoidance of treatment recommendations. Analysis will be conducted on patients seen by oncologists between September 1, 2017 and February 28, 2018.

**RESULTS:** Oncology pharmacists made recommendations in multiple disease states with the majority being in breast, lymphoma and lung. Of the 85 recommendations made, 60% (51/85) were accepted indicating physician receptiveness to a pharmacist-driven clinical pathway. The oncology pharmacist made multiple types of recommendations such as new therapy recommendations, laboratory testing, mutational testing, discontinuing therapy, supportive care, switching therapy and clinical trials. Recommendations resulted in an estimated cost-avoidance of $739,900.

**CONCLUSION:** We found that physicians were receptive to a clinical pathway and creating clinical pathways has improved communication and relationships with physician groups. An oncology pharmacist providing recommendations based on a clinical oncology pathway can improve care and reduce costs.

**317E. Evaluation of pharmacist's impact on hematology oncology chemotherapy orders** Hailey Lin, Master of Pharmacy[1], Vivien Ng, Master of Pharmacy[2], Elton Yip, Bachelor of Pharmacy[1], Peter Chan, Master of Pharmacy[1], *Keary Zhou, Pharm.D.*[3]; [1]Department of Pharmacy, Princess Margaret Hospital, Hospital Authority, Kowloon, Hong Kong [2]Pharmacy Department, Princess Margaret Hospital, Hospital Authority, Kowloon, Hong Kong [3]School of Pharmacy, The Chinese University of Hong Kong, Shatin, Hong Kong

Presented at the International Society for Pharmacoeconomics and Outcomes Research Asia Pacific 2018, Tokyo Japan, September 8-11, 2018.

## OTHER

**318. Access to orphan drugs and quality of life in rare disease** Amar Abbas III, MPharm Pharm.D.[1], Janis Vella, B. Pharm, MSc (Clinical Pharmacy), Ph.D.[2], *Anthony Serracino-Inglott, B.Pharm., Pharm.D.(Cinc.), M.A.C.C.P., M.R.Pharm.S.*[3]; [1]School of Pharmacy, University of Malta, Msida, Malta [2]Department of Pharmacy, University of Malta, Msida, Malta [3]Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Msida, Malta

**INTRODUCTION:** Over 7000 rare diseases (RD) affect around 300 million patients worldwide. To date, there has been no locally conducted study about the healthcare needs of people living with RDs.

**RESEARCH QUESTION OR HYPOTHESIS:** What regulations and policies related to Orphan Drugs (ODs) accessibility exist locally and internationally and how is the Quality of Life of RD patients?

**STUDY DESIGN:** Retrospective analysis and cross sectional study

**METHODS:** A retrospective analysis was carried out to observe features of OD policies in RD patients locally and internationally. A self-administered Health Related Quality of Life (HRQOL) Assessment tool was developed, validated and published online. The HRQOL tool explored issues of diagnosis, information provision at the time of diagnosis, use of health and support services and general quality of life of RD patients including mental health issues. Different patient groups in Asia, Europe, Africa and America were contacted to invite their members to participate.

**RESULTS:** There were OD specific legislations in 29 countries. Accessibility of ODs depended on pricing, re-imbursement policies and drug availability. One hundred and thirty responses given by RD patients were analysed. Sixty percent (n=78) of responses gathered were from Malta, 20% (n=26) from Ireland and 10% (n=13) from the USA. Accessibility issues were a hurdle for RD patients as 50% (n=65) reported

that medication is available in other countries but not in their country. Forty percent (n=52) received a misdiagnosis and 30% (n=39) were waiting over 1 year to receive a diagnosis. Seventy percent (n=91) of patients complained of stress and anxiety problems.

**CONCLUSION:** All the countries in this study had an OD regulation in place. There were differences between countries in pricing, licensing and reimbursement of ODs which have an impact on accessibility. There is a need for improvement in the quality of life of RD patients.

**319. A comparison of approved indications between regulatory agencies** Matthew Camilleri, B.Sc. (Hons) (Pharm.Sc.), M.Pharm.[1], *Anthony Serracino-Inglott*, *B.Pharm.*, *Pharm.D.(Cinc.)*, *M.A.C.C.P.*, *M.R. Pharm.S.*[1], Nicolette Sammut Bartolo, B.Pharm.(Hons)(Melit.), M.Sc. (Melit.), Ph.D.(Melit.)[1], John-Joseph Borg, BPharm Hons., MSc Agric. Vet.Pharm, Ph.D.[2]; [1]Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Msida, Malta [2]Sir Temi Zammit Buildings, Malta Life Sciences Park, San Ġwann, SGN 3000, Malta., Medicines Authority, San Gwann, Malta

**INTRODUCTION:** Medicinal products are allowed on the market following approval by autonomous regulatory agencies which are tasked with their evaluation. Differences in evaluation practices during the registration of medicinal products are found in Europe and the United States of America which may lead to discrepancies in clinical guidelines, pricing policies, and drug use.

**RESEARCH QUESTION OR HYPOTHESIS:** Are there differences in the authorised drug indication/s between the European Medicines Agency (EMA) and the US Food & Drug Administration (FDA) using new molecular entity cardiology-related medicinal products as models?

**STUDY DESIGN:** Retrospective observational review study.

**METHODS:** All cardiology-related medicinal products assessed by the EMA were identified using the Anatomical Therapeutic Chemical (ATC) code and cross-matched with the FDA counterparts using active ingredients, branded names and authorisation holder details. The assessment reports from the EMA, the reviews from the FDA and initial product information for each identified drug were obtained. A tool was developed and validated to compare the differences between authorised indications.

**RESULTS:** Twenty-six products with a marketing authorisation from both agencies were identified. A total of fourteen products were found to have different indications when comparing the label to the Summary of Product Characteristics (SmPC). Differences in the indications have been categorised according to the following restrictions: disease states (n=5), patient characteristics (n=4), different clinical scenario (n=3), severity of the condition (n=3), combination (n=3), previous therapy failure (n=1), inappropriate alternative therapies (n=1). Reasons for such restrictions have been mainly attributed to alignment with the conducted clinical trials. Both agencies have been found to restrict indications.

**CONCLUSION:** Differences in approved indications exist between the EMA and the FDA. Pharmaceutical companies also contribute to discrepancies based on marketing strategies employed during submission of applications. Regulatory collaboration between agencies is deemed essential to ensure a harmonised approach to the use of medications.

**320. Developing safe and effective medicinal products to treat leber hereditary optic neuropathy (LHON). clinical and regulatory challenges** Zuccarelli Marta, Master's Degree in Pharmacy[1], John-Joseph Borg, BPharm Hons., MSc Agric.Vet.Pharm, Ph.D.[2], Janis Vella, B. Pharm, MSc (Clinical Pharmacy), Ph.D.[3], *Anthony Serracino- Inglott*, *Pharm.D.*[3]; [1]Departement of Pharmacy, University of Malta, Msida (MSD), Malta [2]Sir Temi Zammit Buildings, Malta Life Sciences Park, San Ġwann, SGN 3000, Malta., Medicines Authority, San Gwann, Malta [3]Department of Pharmacy, University of Malta, Msida, Malta

**INTRODUCTION:** Leber Hereditary Optic Neuropathy (LHON) is a rare maternally-inherited mitochondrial optic neuropathy caused by three mitochondrial DNA point mutations. In the EU, Raxone (Idebenone) is the only approved medicinal product (MP) to treat LHON. There are no FDA-approved MPs for LHON in the US.

**RESEARCH QUESTION OR HYPOTHESIS:** Which MPs are in development to treat LHON? Which clinical development programs (CDPs) are being pursued by pharmaceutical companies when developing MPs to treat LHON?

**STUDY DESIGN:** Review

**METHODS:** MPs to treat LHON were identified. Mechanism of action and site of action of MPs and nature of active substances were identified. A prospective treatment protocol was suggested and emerging patterns in primary endpoints studied over time were identified and compared. Regulatory pathways to obtain a licence for orphan medicinal products were analysed.

**RESULTS:** Eleven MPs suitable to treat LHON are in development: 7 products are small molecules, 3 products consist of advanced therapies and 1 product consists of phototherapy. Five out of 11 MPs are modulating agents, 3 out of 11 are inhibitors of apoptosis, 2 out of 11 consist of gene therapy products and 1 out of 11 consists of reverse-disease therapy. Ten products out of 11 act at a mitochondrial level and 1 product out of 11 acts on retinal ganglion cells. One out of 11 products, Raxone, has a marketing authorisation in the EU and 1 product, $rAAV_{2,}$ obtained the orphan designation. Comparison among CDPs shows that different primary endpoints are being studied in phase III trials.

**CONCLUSION:** There is a need to develop adequate CDPs for the approval of MPs to treat LHON in the EU and US.

**321. Implementation of a redesigned workflow model focused on quality improvement of interprofessional care in an underserved clinic** *Amanda Li*, *Student pharmacist*, Kimberly Lui, Student pharmacist, Huiling Zhang, Student pharmacist, Sharon E. Connor, Pharm.D.; School of Pharmacy, University of Pittsburgh, Pittsburgh, PA

**INTRODUCTION:** The Birmingham Free Clinic (BFC) provides primary care and prescription medications to the underserved population in Pittsburgh, Pennsylvania. At BFC, medically complex patients may be

referred to Panther Clinic, which is an interprofessional teaching clinic. The clinic provides patients with longitudinal care while also allowing students to gain clinical experience. To elaborate, pharmacy students volunteer alongside medical students under the guidance of a PGY2 pharmacy resident and an attending physician. At Panther Clinic, consistent workflow challenges have prevented the pharmacy resident from contributing to value based (VB) activities that affect patient care and student learning.

**RESEARCH QUESTION OR HYPOTHESIS:** Implementation of a new clinic workflow model will decrease the amount of time the pharmacy resident spends on NVB activities and increase the time spent on VB activities. It will also encourage greater organization of labor and define the responsibilities of each participant on the pharmacy team (pharmacy resident, pharmacy student volunteers).

**STUDY DESIGN:** A total of four time motion studies were conducted to measure the pharmacy resident's distribution of time. Two were conducted before the intervention, and two were conducted after the intervention.

**METHODS:** A codebook was developed to categorize VB and NVB tasks. After categorization, the distribution of the pharmacy resident's time was determined for each time motion study. The percentage of time spent on tasks before and after the intervention was compared.

**RESULTS:** The intervention increased the time the pharmacy resident spent on VB tasks by 19.60% and decreased the time spent on NVB tasks by 23.66%.

**CONCLUSION:** The increase in time spent on VB activities (19.6%) was the result of better defining the responsibilities of each volunteer's role in the clinic. Implementation of the new workflow model achieved the goal of increasing the time spent on direct patient care activities while decreasing the time spent on NVB activities.

**322. Impact of an electronic dispensing and inventory management system (EDIM) on prescribing patterns for communicable diseases in rural honduras** *Angela Li, Pharm.D. Candidate*[1], Nicolette Diehl, Pharm. D.[2], Doreen Foy, Pharm.D.[1], Sharon E. Connor, Pharm.D.[2], Lauren J. Jonkman, Pharm.D., MPH[2], Mark Meyer, MD[3]; [1]University of Pittsburgh School of Pharmacy, Pittsburgh, PA [2]School of Pharmacy, University of Pittsburgh, Pittsburgh, PA [3]University of Pittsburgh Medical Center, Pittsburgh, PA

**INTRODUCTION:** Effective medication supply management can prevent medication stock-outs. While continuous access is critical for all medicines, stock-outs of antimicrobials can lead to inappropriate prescribing contributing to antibiotic resistance. A rural health clinic in Honduras implemented an electronic Dispensing and Inventory Management System (eDIM) in the fall of 2016. The purpose of this study was to assess the impact of eDIM on medication prescribing for communicable diseases.

**RESEARCH QUESTION OR HYPOTHESIS:** How does the implementation of eDIM impact prescribing patterns of antibiotics in a rural health clinic in Honduras?

**STUDY DESIGN:** Retrospective chart review

**METHODS:** A retrospective chart review was conducted in a rural clinic in Honduras pre- and post-implementation of eDIM. All charts for patients seen between March 2016 and February 2018 with a diagnosis of community acquired pneumonia (CAP), acute otitis media (AOM), upper respiratory tract infections (URI), and diarrhea were included. Data extraction used standardized data collection forms. Pre/post-prescribing patterns were compared using descriptive statistics and Chi-Square tests.

**RESULTS:** A total of 260 charts met inclusion criteria. For CAP, pre/post-implementation, 37/38 (97%) vs. 15/15 (100%) received an antibiotic (p=NS). For AOM, pre/post-implementation, 22/22 (100%) vs. 26/27 (96%) received an antibiotic (p=NS). For URI, pre/post-implementation, 16/43 (37%) vs. 42/78 (53%) received an antibiotic (p=NS). Changes in specific antibiotic use were non-significant. For diarrhea, pre/post-implementation, 5/14 (35.7%) vs. 1/23 (4.3%) received broad-spectrum antibiotics (p=NS). Pre/post implementation, 1/14 (7.1%) vs. 12/23 (52.2%) received fluids (either oral rehydration salts (ORS) or intravenous fluids (IVF)) (p=0.005).

**CONCLUSION:** Results showed high antibiotic use overall in this setting with no significant change in prescribing for AOM, CAP, and URI after the implementation of eDIM. However, there was a significant increase in the use of fluids (either ORS or IVF) in the treatment of diarrhea after eDIM. The next step in the research is to determine how medication availability impacted prescribing differences.

**323. Trends in women's authorship in pharmacy literature** Rebecca Hoover, Pharm.D., MBA[1], Ademola Are, Pharm.D. Candidate[1], Kalon Ludvigson, Pharm.D. Candidate[1], *Elaine Nguyen, Pharm.D., MPH*[2]; [1]Department of Pharmacy Practice and Administrative Sciences, Idaho State University College of Pharmacy, Pocatello, ID [2]Department of Pharmacy Practice and Administrative Sciences, Idaho State University College of Pharmacy, Meridian, ID

**INTRODUCTION:** Previous studies, conducted nearly a decade ago, indicated an increase in women authorship in pharmacy journals. As the number of women in the pharmacy profession has increased, it is unknown whether women's contribution to pharmacy literature has also increased.

**RESEARCH QUESTION OR HYPOTHESIS:** Has the proportion of women as first authors in the pharmacy literature increased in the past decade?

**STUDY DESIGN:** Retrospective bibliometric analysis

**METHODS:** Web of Science was used to export citations from prominent pharmacy journals from 2007 through 2017. The outcome of interest was the proportion of articles having feminine names as first authors. Femininity of the first author was determined by matching first name to data from the Social Security Administration or genderize.io. The Cochran-Armitage trend test was used to determine differences in the proportion of women as first authors over time with a p-value of <0.05 considered statistically significant. Data were exported and prepared in Excel with statistical analysis performed in SPSS.

**RESULTS:** The proportion of articles with women as the first author increased from 2007 through 2017 in three of the four pharmacy

journals evaluated (**Table**). No significant change over time was observed in the Journal of the American Pharmacist Association, but this journal also began with >50% women authorship at the beginning of the time period of interest.

**CONCLUSION:** There has continued to be an increase in women as first authors in the pharmacy literature over the past decade. **Table**

| | # of articles with women as first authors/total # of articles (%) | |
|---|---|---|
| **Journal** | **2007** | **2017** |
| American Journal of Health-System Pharmacy | 267/462 (57.8) | 219/344 (63.7)* |
| Annals of Pharmacotherapy | 146/303 (48.2) | 67/146 (45.9)* |
| Journal of the American Pharmacist Association | 56/102 (54.9) | 94/162 (58.0) |
| Pharmacotherapy | 92/208 (44.2) | 145/236 (61.4)* |

*Statistically significant change from 2007-2017; 2008-2016 data represented but not shown

**324. Interpretation and understanding of prescription warning labels by refugees** *Syed Samad, Pharm.D. Candidate*[1], Gina M. Prescott, Pharm.D., BCPS[2]; [1]Department of Pharmacy Practice, UB School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY [2]School of Pharmacy and Pharmaceutical Sciences, University at Buffalo, Buffalo, NY

**INTRODUCTION:** Patients commonly misunderstand prescription warning labels (PWLs), which can lead to medication errors and adverse events, especially in those with low literacy. There is no information available on how refugees interpret PWLs.

**RESEARCH QUESTION OR HYPOTHESIS:** Is a refugee able to interpret commonly used PWLs?

**STUDY DESIGN:** Qualitative, semi-structured interview

**METHODS:** In-person evaluations were conducted by pharmacy students at 3 locations during English second language classes as part of a medication health literacy program. Eleven commonly used PWLs (refrigerate, take with food, may cause drowsiness, for the ear, take with water, external use only, shake well, finish all, no alcohol, do not drive, avoid sunlight) were evaluated. Refugees were provided a PWL in English and asked what the PWL meant to them using an interpreter. Their response was recorded, if incorrect, education was provided on the correct meaning of the label. Descriptive statistics and Fisher's exact test were used to analyze the data.

**RESULTS:** A total of 136 refugees speaking 19 different languages were evaluated. The majority of the refugees spoke Spanish (n=26), Burmese (n=21), Arabic (n=19), or Nepali (n=18). Most refugees were mainly in the United States for 1-2 years (33%) or 6 months-1 year (25%). "For the ear" was the PWL most commonly interpreted correctly (53%), while "refrigerate" was the PWL least commonly interpreted correctly (24%). Spanish, Burmese, Karen, Congolese, and Vietnamese speakers were more likely to be correct in their interpretation of PWLs compared to the overall group ($p<0.05$). Those speaking Arabic, Nepali, French, Chinese, Farsi and Swahili were less likely to be correct ($p<0.05$).

**CONCLUSION:** Refugees were able to communicate with the assistance of an interpreter, however, as a group, still had difficulty understanding PWLs. Pharmacists need to be aware that PWLs do not appear to aid in a refugee's understanding of medication information.

**325. Comparison of faculty and standardized patient global scores used to evaluate students' communication skills during performance-based assessments** *Kylie Barnes, Pharm.D.*[1], Maqual Graham, Pharm. D.[1], Karen Hardinger, Pharm.D.[2]; [1]Division of Pharmacy Practice and Administration, University of Missouri Kansas City School of Pharmacy, Kansas City, MO [2]Department of Pharmacy Practice, UMKC, Kansas City, MO

**INTRODUCTION:** Reliable and valid assessments of pharmacy students' clinical skills and competencies are essential. Analytical scoring and global rating are two commonly used scoring systems in objective structured clinical examination (OSCE).

**RESEARCH QUESTION OR HYPOTHESIS:** To investigate the correlation of faculty and standardized patient (SP) global assessment scores assigned to pharmacy students during multiple OSCEs.

**STUDY DESIGN:** A retrospective review of faculty and SP global scores was conducted for comparison.

**METHODS:** Second and third year pharmacy students completed a two-station OSCE as course final assessments in spring 2018. A binary analytic checklist and a global assessment tool with five distinct sections (verbal expression, non-verbal expression, response to patient's feelings and needs, degree of focus, logic and coherence, and professionalism) were used. The global score was assigned by 18 trained faculty evaluators and 18 trained SPs independently using a 1-5 likert scale. Scores from both the faculty evaluators and SPs were evaluated to determine differences in assessment of student performance using Spearman's rho.

**RESULTS:** A total of 570 student cases were evaluated. The median faculty global score was 3 and the median SP global score was 3. Fifty percent of the faculty and SP global scores were equal, 32% of the SP scores were higher where 18% of the SP scores were lower. There was a weak correlation between students' faculty and SP global score in the second year ($r=0.253$, $P<0.01$), third year ($r=0.342$, $P<0.01$) and for combined second and third year students ($r=0.263$, $P<0.01$).

**CONCLUSION:** SPs tend to globally score students higher than faculty members. Revised training of faculty and SP evaluators is warranted to improve reliability and validity of the assessment tool. Future studies are needed to determine the best methods for assessing global scores.

**326. Assessing impact of an electronic dispensing and inventory management system (EDIM) on prescribing patterns for non-communicable diseases in a rural health clinic in honduras** *Niha Idrees, BS, Pharm.D. Candidate*[1], Eryn Gordon, BS, Pharm.D. Candidate[1], Doreen Foy, Pharm.D.[1], Nicolette Diehl, Pharm.D.[1], Sharon E. Connor, Pharm.

D.[2], Lauren Jonkman, Pharm.D., MPH[1], Mark Meyer, MD[3]; [1]University of Pittsburgh School of Pharmacy, Pittsburgh, PA [2]School of Pharmacy, University of Pittsburgh, Pittsburgh, PA [3]University of Pittsburgh Medical Center, Pittsburgh, PA

**INTRODUCTION:** Medication challenges faced in resource-limited settings include inventory management and stock-outs. In March 2017, an electronic Dispensing and Inventory Management (eDIM) was implemented at a rural health clinic in Honduras. Little is known about the impact of informatics interventions on medication supply and resulting prescribing patterns.

**RESEARCH QUESTION OR HYPOTHESIS:** How did prescribing patterns change for common non-communicable diseases (NCDs) after the implementation of eDIM?

**STUDY DESIGN:** Retrospective chart review

**METHODS:** All charts of patients seen from March 2016 – February 2018 with a diagnosis of asthma, hypertension, or diabetes were included. Trained data collectors used standardized forms for each of the included diseases for data abstraction. Data was summarized using descriptive statistics; prescribing patterns were pooled and analyzed using Chi-square tests.

**RESULTS:** For asthma, 69 patients with persistent asthma were evaluated: 27 pre-eDIM and 42 post-eDIM. Pre-eDIM, patients were prescribed SABAs (81%), inhaled corticosteroids (ICS) (44%), and anticholinergics (19%). Post-eDIM, more patients were prescribed SABAs (93%) and ICS (81%), with no patients prescribed anticholinergics (p=0.02). For hypertension, 242 patients were evaluated: 115 pre-eDIM and 127 post-eDIM. Pre-eDIM anti-hypertensives included ACE inhibitors (42%), thiazides (29%), calcium channel blockers (25%), beta-blockers (19%), loop diuretics (10%), and ARBs (3%). After eDIM, medications included ACE inhibitors (46%), calcium channel blockers (41%), thiazides (36%), beta-blockers (13%), loop diuretics (10%), and ARBs (8%) (p=NS). For diabetes, 87 patients were evaluated: 37 pre-eDIM and 50 post-eDIM. Glucose lowering medications pre-eDIM included insulin (3%), biguanides (49%), and sulfonylureas (48%). After eDIM, medications included biguanides (54%), sulfonylureas (45%), and meglitinides (1%) (p=NS).

**CONCLUSION:** After the launch of eDIM, more patients with persistent asthma were prescribed ICS. Prescribing patterns for other NCDs were not significantly different. The improvement of ICS may have been secondary to improved inventory management and medicine availability. Further improvements in prescribing may require educational interventions.

**327. Relevance of clinical pharmacy interventions** *Antoine Dupuis, Pharm.D., Ph.D.*, Guillaume Binson, Pharm.D., Fanny Durand, Pharm. D., Pauline Lazaro, Pharm.D.; Pharmacy Department, University Hospital of Poitiers, POITIERS, France

**INTRODUCTION:** Prescription analysis is the core of the Pharmacist role. In our establishment, we chose to optimize our analysis with the implementation of a tool corresponding to a collection of relevant clinical pharmacy interventions, validated in a multidisciplinary way, based on the identification of Potentially Iatrogenic Situations (PISi). Thirty-six PISis have been listed.

**RESEARCH QUESTION OR HYPOTHESIS:** The aim of this study was to assess the impact of this tool on our practices as well as the acceptability of PIs by physicians.

**STUDY DESIGN:** Prospective study in an academic hospital.

**METHODS:** PIs were collected over six months from the prescription software. Each PI has been rated according to the French Society of Clinical Pharmacy (SFPC) guidelines.

**RESULTS:** 436 PIs were identified from 32 care units. 62.2% of these PIs were related to a listed PISi among which 55.7% for the PISi entitled "prescription off booklet", 7.7% for "anticoagulant prophylaxis" and 6.3% for "prescription of a level III analgesic". 57.2% of PIs were related to a non-conform prescription or to a contraindication, 22% were associated with an overdose and 9.8% with an inappropriate administration. The ATC classes most frequently involved were CNS drugs, digestive and metabolic drugs, antineoplasics and immunomodulatory drugs or cardiovascular drugs. Regarding the nature of the proposed PIs, 39.6% involved a substitution or exchange, 28.6% a dose adjustment and 14.6% an optimization of the administration. 76% of PIs were consulted by physicians among them, 76.4% resulted in a treatment modification.

**CONCLUSION:** Most of our interventions concern PISis. The rate of the PIs accepted by the prescribers demonstrates the relevance of our tool. The details of these results have been presented to physicians of each care units. Non-accepted PIs have been analyzed in detail and discussed with physicians in order to improve our tool.

**328. Current state of medication disposal practices among university of California San Francisco health professions students** *Yaser Khoshal, BS*[1], Hugo A. Aguilar, BS[1], Katherine Gruenberg, Pharm.D..[1], B. Joseph Guglielmo, Pharm.D.[2]; [1]School of Pharmacy, University of California San Francisco, San Francisco, CA [2]School of Pharmacy, University of California, San Francisco, San Francisco, CA

**INTRODUCTION:** Medications thrown away or flushed in the water system negatively impact the environment. Safe medication disposal can serve as a primary intervention in preventing drug diversion and accidental poisonings. Health professional trainees can educate patients about proper medication disposal methods. However, few students receive such training and the current practices and beliefs of health professional trainees about this issue are unknown.

**RESEARCH QUESTION OR HYPOTHESIS:** What are the current practices and beliefs of health professions students about medication disposal?

**STUDY DESIGN:** This was a cross-sectional, electronic survey of health professions students at the University of California, San Francisco (UCSF).

**METHODS:** All registered students at UCSF were invited to take an anonymous electronic survey between October 2017 to February 2018. Information about medication use, disposal practices, and beliefs about improper medication disposal were gathered.

**RESULTS:** A total of 428 students from the Schools of Pharmacy (49.8%), Medicine (19.4%), Nursing (14.7%), Dentistry (12.9%), and the Graduate Division (3.2%) completed the survey. Over 57% of respondents stated they use one or more medications regularly. The most commonly reported medications included analgesics (28.3%) and hormones (24.1%). A majority of respondents (80%) indicated they do not utilize a medication disposal program. Those who safely disposed of medications used pharmacies (11.3%), police stations (5.0%), national take-back events (2.5%), and doctor's office (1.2%). Accessibility was stated as the primary barrier to practicing safe medication disposal. Almost 90% of respondents believe a drug disposal program can mitigate pharmaceutical pollution, accidental poisonings, and drug diversion.

**CONCLUSION:** Our study quantified current medication use and disposal practices among UCSF health professions students. Our results support the need for more information about and accessibility to a safe medication disposal program at UCSF. Proper medication disposal practices should be addressed in the curriculum of health professions students at UCSF.

## PAIN MANAGEMENT/ANALGESIA

**329. 10-year trends in opioid analgesic utilizations: the multi-institutional study in Taiwan** Yi-Hua Chen, BPharm[1], *Shih-Chieh Shao, MS*[1], Yuk-Ying Chan, MS[2], Hui-Yu Chen, MS[1]; [1]Department of Pharmacy, Keelung Chang Gung Memorial Hospital, Keelung, Taiwan [2]Department of Pharmacy, Linkou Chang Gung Memorial Hospital, Linkou, Taiwan

**INTRODUCTION:** Pain is the major public health issue for all countries, and regular measures of opioid analgesic consumption could improve the quality of pain management. In Taiwan, there are several opioid analgesic recently approved for pain controls, such as oxycodone and hydromorphone, but no data provides the consumption of opioid analgesics after 2014.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the trend of opioid analgesic consumption and prevalence rate of opioid analgesics for cancer pain in Taiwan?

**STUDY DESIGN:** Retrospective study.

**METHODS:** We conducted the descriptive study using Chang Gung Research Database (CGRD) which contained 6% of Taiwanese outpatients between 2008 and 2017. We extracted the prescription data of morphine, fentanyl, meperidine, codeine, buprenorphine, oxycodone and hydromorphone, and calculated the daily doses for statistical purposes per million patients in CGRD per day (S-DDD/m/d) in each opioid. We defined the indication of the opioid analgesic prescriptions for cancer pain managements when patients had also been diagnosed with cancer-related diagnoses (ICD-9: 140-239; ICD-10: C00-D49) during study periods.

**RESULTS:** We included 1.4 million outpatients in CGRD, and the total consumption of opioids markedly increased from 866.2 to 1170.5 S-DDD/m/d (+135.1%) during 10-year observation in Taiwan. We analyzed a total of 1,044,550 opioid prescriptions, and 59.6% of patinents were classified as the cancer pain managements which increased from 53.7% in 2008 to 62.8% in 2017 (+4.4%). By category, the consumption of morphine (+130.6%), fentayl (+124.6%), but the use of meperidine (-97.4%), codeine (-20.3%) and buprenorphine (-11.3%) decreased. We found the consumption of oxycodone (+273.0%) and hydromorphone (+134.2%) quickly increased during 2016-2017 and 2015-2017, respectively.

**CONCLUSION:** Our findings indicated the increasing demand for opioids, especially in the new opioid analgesics, and non-cancer pain managed with opioid analgesics was still prevalent in Taiwan. Further studies needed to evaluate the benefits and risks associated with such therapy.

**331. Comparison of prevalence and factors for long-term opioid use for chronic non-cancer pain by using nationwide health database versus governmental surveillance system in Taiwan** *Ya-Han Lee, MS*[1], Yu-Ning Huang, MS[2], Kuei-Ju Cheng, Pharm.D.[1], Li-Na Kuo, MS[3], Hsiang-Yin Chen, Pharm D., MS[2]; [1]Department of Pharmacy, Wan Fang Hospital, Taipei Medical University, Taipei, Taiwan [2]Department of Clinical Pharmacy, School of Pharmacy, Taipei Medical University, Taipei, Taiwan [3]Wan-Fang Hospital, Taipei Medical University, Taipei, Taiwan

**INTRODUCTION:** Prescribing chronic opioid therapy (COT) for chronic non-cancer pain (CNCP) has expanded over the past two decades. In Taiwan, hospitals are responsible to report the COT recipients of CNCP to the National Bureau of Controlled Drugs (NBCD).

**RESEARCH QUESTION OR HYPOTHESIS:** The primary question investigated was whether the yearly prevalence of COT for CNCP derived from the Taiwan National Health Insurance Research Database (NHIRD), the sample from the reimbursement system, was identical to previous findings from the NBCD. A secondary question was to determine risk factors for receiving COT for CNCP.

**STUDY DESIGN:** A retrospective, population-based cohort study

**METHODS:** The yearly prevalence of COT for CNCP was calculated by using NHIRD during 2005 to 2011. COT recipients, defined by NBCD, were adults having CNCP, and receiving opioids consecutively for 14 days or intermittently over 28 days within three months. Candidate opioids included morphine, fentanyl, meperidine, codeine and buprenorphine. Potential risk factors for CNCP patients to receive COT were identified by comparing the characteristics to those receiving adjuvant analgesics as active comparators by logistic regression using SAS EG program.

**RESULTS:** A prevalence of COP for CNCP was 0.016% from the NHIRD, which was markedly different from the 0.003% found using the NBCD. It was noted that there was a 70% increase from 30 to 51 per one million population during the 7 year period. Associated risk factors for receiving COT were back pain (OR 1.79; 95% CI 1.24-2.58), alcohol use disorder (OR 7.29; 95% CI 1.3-34.81), previous use of other weaker opioids (OR 7.56; 95% CI 4.83-11.84), and benzodiazepines (OR 1.73; 95% CI 1.22-2.45).

**CONCLUSION:** Risk factors identified in this study may assist in the clinical decision making for use of COT for NHIRD. Further study is

warranted to determine the reason for the prevalence gap in the governmental surveillance system.

**332. Evaluation of naloxone co-prescribing in ambulatory patients receiving palliative care** *Lorin Fisher, Pharm.D.*, James Ray, Pharm.D., Kashelle Lockman, Pharm.D., MA; University of Iowa College of Pharmacy, University of Iowa Hospitals and Clinics, Iowa City, IA

**INTRODUCTION:** The CDC & AMA recommend naloxone co-prescribing for patients receiving chronic opioid therapy (COT) with risk factors for opioid overdose or serious opioid-induced respiratory depression (OSORD). Palliative care patients are excluded from this recommendation due to uncertain prognoses yet often receive COT. Naloxone co-prescribing in this population remains controversial; no studies to date describe risk factors for OSORD among patients receiving palliative care.

**RESEARCH QUESTION OR HYPOTHESIS:** Objectives of this study are to: 1) describe risk factors for OSORD among ambulatory palliative care patients, and 2) determine frequency of naloxone co-prescribing overall as well as when pharmacy services were available versus unavailable.

**STUDY DESIGN:** IRB-approved retrospective observational study.

**METHODS:** Charts were retrospectively reviewed to identify patients seen in a palliative care clinic who were prescribed opioids between March and June 2017. Published risk factors for serious opioid-induced respiratory depression, including factors in the Risk Index for Overdose or Serious Opioid-Induced Respiratory Depression (RIOSORD) tool, were extracted from each included patient's chart. An indication for naloxone was defined as any CDC or AMA recommended criteria or a RIOSORD score ≥ 18. Naloxone prescribing and pharmacy staffing data were also extracted.

**RESULTS:** Of 91 patients prescribed opioids in a palliative care clinic, 79 (86.8%) had ≥ 1 possible indication for naloxone. Risk factors of interest included daily oral morphine equivalent ≥ 100 mg (60%) and concurrent benzodiazepine prescription (34.2%). Approximately 34.2% of eligible patients were co-prescribed naloxone. Naloxone was co-prescribed more frequently when clinical pharmacy services were available in clinic (37.1% vs. 23.5%, p = 0.39).

**CONCLUSION:** Naloxone co-prescribing may be beneficial for ambulatory patients receiving palliative care if consistent with their goals of care, as risk factors for OSORD are prevalent in this population. The impact of pharmacy involvement in the palliative care clinic on naloxone co-prescribing should be further explored.

**333. Determining clinically important risk factors for an opioid stewardship clinical dashboard: a delphi consensus study** L Diana Berescu, Pharm.D.[1], *Julie Waldfogel, Pharm.D.*[1], Mark Bicket, MD[2], Nicole Arwood, Pharm.D.[1], Rosemary Call-Duncan, Pharm.D.[1], Ahmed Eid, Pharm.D.[1], Laura Hatfield, Pharm.D.[3], Joann Hunsberger, MD[1], LeAnn McNamara, Pharm.D.[1], Todd Nesbit, Pharm.D., MBA[1], Jacob Smith, Pharm.D., MBA[1], Jackie Tran, Pharm.D., BCPS[4], Tricia Vecchione, MD[1], Suzanne Nesbit, Pharm.D., BCPS, CPE[3]; [1]The Johns Hopkins Hospital, Baltimore, MD [2]The John Hopkins Hospital, Baltimore, MD [3]Department of Pharmacy, The Johns Hopkins Hospital, Baltimore, MD [4]Johns Hopkins Medicine, Baltimore, MD

**INTRODUCTION:** The opioid epidemic continues to result in significant morbidity and mortality. The epidemic's reach extends inside the hospital, where opioids account for the second most common cause of adverse events in hospitalized patients. In response, regulatory agencies have developed prescribing guidelines and regulations surrounding opioid prescriptions. Opioid stewardship programs may be one model for hospitals to ensure safe, rational prescribing to produce optimal clinical benefit and mitigate preventable adverse outcomes. Mechanisms are needed to identify patients with risk factors for opioid-related adverse events. Recent literature has identified several risk factors with varying clinical importance.

**RESEARCH QUESTION OR HYPOTHESIS:** The objective of this project is to establish expert consensus about risk factors to be included in a clinical dashboard to identify patients at risk of opioid-related adverse events.

**STUDY DESIGN:** A Delphi approach was used to generate consensus among a national group of experts.

**METHODS:** A four-round online Delphi survey was conducted along with two teleconference meetings. The initial two rounds obtained consensus on which adverse events and risk factors should be included. In the third and fourth rounds, participants ranked the importance of each risk factor for the given adverse event.

**RESULTS:** Seventeen participants completed the first round, 15 completed the second round, 12 completed the third round and 12 participants completed the fourth round. Participants consisted of pharmacists, physicians, and a nurse practitioner. Overdose after discharge, inpatient respiratory depression, sedation, confusion, uncontrolled pain, constipation, and withdrawal adverse events all achieved consensus to be included in a dashboard. Each adverse event included a list of risk factors ranging from four to over 50 risk factors identified.

**CONCLUSION:** This Delphi consensus approach yielded a list of risk factors and a score indicating risk of opioid-related adverse event which may incorporated into a clinical dashboard.

**334. Naloxone prescribing patterns within providence medical group (PMG)** Monica Dougherty, Pharm.D., Amanda Wojtusik, Pharm.D., BCPS, Dara Johnson, Pharm.D., BCPP, *Kristin Tallman, Pharm.D., BCPS, BCACP*; Clinical Pharmacy Department, Providence Medical Group, Portland, OR

**INTRODUCTION:** In 2016, the CDC published guidelines recommending clinicians offer naloxone to patients at increased risk of overdose. This recommendation includes those taking ≥50 morphine milligram equivalents (MME) per day. It is unclear if patients at risk for overdose are being prescribed naloxone.

**RESEARCH QUESTION OR HYPOTHESIS:** What percentage of high risk patients (≥50 MME per day) were prescribed naloxone during 2017 and what patient characteristics led to naloxone prescribing?

**STUDY DESIGN:** Retrospective review during the year 2017.

**METHODS:** Patients included were those with a Providence Medical Group primary care physician in the Portland, OR metro area. An opioid reporting tool was used to identify patients on ≥50 MME per day, and characteristics were collected on a randomly selected patient sample of this group. The other cohort included patients prescribed naloxone regardless of opioid dose. Characteristics collected included MME dose, history of substance abuse or respiratory disorders, Pharm.D. involvement in patient care, naloxone dosage form, opioid taper plans, and concurrent benzodiazepine use. Characteristics of patients prescribed naloxone were compared to those not prescribed naloxone.

**RESULTS:** 110 patients were prescribed naloxone during 2017. The opioid reporting tool identified over 1,000 patients on ≥50 MME per day who were not co-prescribed naloxone; characteristics were collected on 100 of these patients. Average age was 53 years in the naloxone group and 66% were female. Less than 10% of patients on ≥50 MME per day were prescribed naloxone during 2017. Characteristics between groups prescribed naloxone versus those not prescribed naloxone were similar, although patients prescribed naloxone were more likely to have a pharmacist involved in their care compared to those not prescribed naloxone (26% vs 8%, p=0.0026).

**CONCLUSION:** A limited number of patients were prescribed naloxone in 2017. A greater percent of patients prescribed naloxone had a pharmacist involved in their care.

**335. Does early physical therapy intervention reduce the opioid burden in the management of chronic lower back pain?** Victoria Nguyen, Pharm.D., MPH[1], *Kimberly Tallian, Pharm.D., APh, BCPP, FCCP, FASHP*[1], Jason Van Dyke, MSPT[2], Harminder Sikand, Pharm.D., FCCP, FASHP[2]; [1]Department of Pharmacy, Scripps Mercy Hospital, San Diego, CA [2]Family Health Centers of San Diego, San Diego, CA

**INTRODUCTION:** Chronic lower back pain (CLBP), defined as pain persisting ≥ 3 months, is one of the leading causes of disability in about 149 million days of work loss per year. Opioid use in the management of chronic, nonmalignant pain continues to be controversial especially with its potential for tolerance and addiction. Per CDC Guideline on chronic pain, both nonpharmacologic and nonopioid pharmacologic therapy are preferred.

**RESEARCH QUESTION OR HYPOTHESIS:** Will early intervention physical therapy (PT) reduce the opioid burden in patients with chronic lower back pain (CLBP)?

**STUDY DESIGN:** IRB-approved, single center retrospective chart review.

**METHODS:** Ambulatory care patients ≥ 18 years with CLBP for ≥ 3 months, received ≥ 6 PT visits, and were treated with either any opiate first (OF) and/or PT first (PTF) between 2014 and 2017 were included. Concomitant use of non-opioid pharmacological agents was also permitted. The primary outcome measure was to determine the impact of early PT on opiate burden and pain scores. Descriptive statistics were used where applicable.

**RESULTS:** Of the 120 patients enrolled, more patients treated in OF arm compared to the PTF arm were diagnosed with depression (53% vs 28%, p=0.009) or had a history of falls within the past 12 months (45% vs 15%, p=0.0002). Only 5% of patients in the PTF arm required the addition of an opiate as opposed to 60% of patients in the OF arm, who continued opiate therapy after the initiation of PT treatment. Once PT treatment was initiated, a significant reduction of opiate use was seen in the OF arm (p=0.0003) whereas a significant reduction of non-opiate use was seen in the PTF arm (p=0.0001).

**CONCLUSION:** Results from this study suggest that PT intervention should be used first concomitantly with a non-opiate modality to manage CLBP prior to initiating opiate therapy.

## PEDIATRICS

**336. Development of a pharmaceutical care model within paediatric oncology** Sephorah Falzon, B.Sc. (Hons) Pharm.Sc. (Melit.), M.Pharm. (Melit.)[1], Nathalie Galea, Doctor of Medicine and Surgery[2], Victor Calvagna, Doctor of Medicine and Surgery[2], Louise Grech, B.Pharm (Hons), MPhil, Ph.D, MRPharmS[1], *Lilian M. Azzopardi, BPharm. (Hons.). MPhil., Ph.D.., MRPharmS, FFIP*[3]; [1]Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Msida, Malta [2]Department of Paediatrics, Mater Dei Hospital, Msida, Malta [3]Department of Pharmacy, University of Malta, Msida, Malta

**INTRODUCTION:** Pharmacists contribute to improved health outcomes and quality of care of paediatric oncology patients by supporting safe and optimum use of complex pharmacotherapy.

**RESEARCH QUESTION OR HYPOTHESIS:** To develop and implement a pharmaceutical care model at the Paediatric Adolescent Ward at Sir Anthony Mamo Oncology Centre.

**STUDY DESIGN:** A cross- sectional prospective study.

**METHODS:** Following ethics approval, the pharmacist investigator attended ward rounds where patients' files, treatment charts and prescriptions were reviewed to identify pharmaceutical care issues (PCIs). The PCIs identified were discussed with the clinicians and the outcomes were recorded. Other pharmaceutical services found to be lacking were developed.

**RESULTS:** A total of 545 PCIs were identified during 325 pharmaceutical care sessions provided over 8 months. These included counselling need to parents/legal guardians about medications (n=147); incorrect dose (n=91); monitoring need (n=84); no indication for drug (n=55); no drug treatment despite existing indication (n=35); missing, wrong or unclear instructions on treatment chart or prescription (n=29); side effect (n=25); seamless care need (n=14); incorrect dosage regimen frequency (n=11); drug interaction (n=10); inappropriate route of administration (n=10) and inappropriate dosage form (n=7). Other pharmaceutical services provided to support the ward service included dosage calculations (n=965); drug information to healthcare professionals (n=374); guiding clinicians and nurses in filling the appropriate pharmacy related forms (n=52); liaison with other pharmacy sections at the hospital (n=48); checking availability and accessibility of drugs (n=31); attending interdisciplinary meetings (n=27); liaison with the unit responsible for patient access to treatment on

the national health scheme (n=8); preparing chemotherapy flow sheets (n=8) and participation in research studies (n=1).

**CONCLUSION:** This study reflects the relevant contribution of the pharmacist at ward level within the interdisciplinary healthcare team through the implementation of a novel pharmaceutical care model which focuses on PCIs and patient specific needs.

**337. Factors associated with the development of immunogenicity to infliximab in children** Valentina Shakhnovich, MD[1], Mara Becker, MD, MSCE[2], *Ryan Funk, Pharm.D., Ph.D.*[3]; [1]Division of Pediatric Gastroenterology, Hepatology and Nutrition, Children's Mercy Kansas City, Kansas City, MO [2]Department of Pediatrics, Division of Rheumatology, Children's Mercy Kansas City, Kansas City, MO [3]Department of Pharmacy Practice, University of Kansas, Kansas City, KS

**INTRODUCTION:** Under exposure to infliximab (IFX) and the development of anti-drug antibodies (ADAs) is associated with response failure in the treatment of pediatric autoimmune illness. This work measures ADAs to infliximab in pediatric patients on IFX and identifies variables associated with the development of immunogenicity.

**RESEARCH QUESTION OR HYPOTHESIS:** Development of ADAs to IFX is associated with the IFX dosing parameters in children.

**STUDY DESIGN:** Cross-sectional study of pediatric patients (n=97) receiving IFX at Children's Mercy Kansas City.

**METHODS:** Serum anti-IFX antibodies were detected using a gene-reporter assay (ARUP Laboratories) and a commercially available immunoassay (Eagle Biosciences). Patient clinical and laboratory information was collected, including IFX dosing parameters, age, weight, gender, co-medication, and laboratory measures of inflammation. Statistical analysis included Wilcoxon rank-sum testing and Spearman's rank correlation testing.

**RESULTS:** Three patients (3.1%) tested positive for ADAs by the gene-reporter assay. These three patients plus an additional six patients (9.7%) tested positive for ADAs by immunoassay. All patients testing positive for ADAs were found to be IBD patients and represented 12.3% of IBD patients tested. None of the children with JIA or uveitis were found to be positive for ADAs. A positive immunogenicity test was associated with lower trough IFX levels for both the gene-reporter assay (p=0.004) and the immunoassay (p=0.0006). Reduced ADA levels were observed in patients on azathioprine (p=0.02), females (p=0.03), and patients being treated for a rheumatologic condition (p=0.02). By Spearman's correlation analysis, reduced ADA levels correlated with a shorter dosing interval ($\rho$=0.33, p=0.001), an increase IFX dose ($\rho$=-0.21, p=0.04), and elevated trough IFX levels ($\rho$=-0.46, p<0.0001).

**CONCLUSION:** Development of ADAs to IFX are more common among children with IBD compared to children being treated for JIA or uveitis. Reduced ADA levels are associated with higher and more frequent dosing of IFX.

**338. Inhaled nitric oxide stewardship in the neonatal intensive care unit** *Deborah Bondi, Pharm.D.*[1], Pooja Shah, Pharm.D.[1], Walid Hussain, MD[2], Allison Barlett, MD[2], Randall Knoebel, Pharm.D.[3], Sherwin Morgan, RRT[4], Steve Mosakowski, RRT-NPS[4], Russell Orr, Pharm.D.[1], Brandi Parker, MSN, RN[5], Jaideep Singh, MD[2], Michael Schreiber, MD[2]; [1]Department of Pharmacy, University of Chicago Medicine, Comer Children's Hospital, Chicago, IL [2]Department of Pediatrics, University of Chicago, Chicago, IL [3]Department of Pharmacy, University of Chicago Medicine, Chicago, IL [4]Department of Respiratory Therapy, University of Chicago Medicine, Chicago, IL [5]Neonatal Intensive Care Unit, University of Chicago Medicine, Comer Children's Hospital, Chicago, IL

**INTRODUCTION:** Inhaled nitric oxide (iNO) is a potent pulmonary vasodilator frequently used in neonates for the management of pulmonary hypertension. Our goal was to reduce unnecessary use of iNO in our Neonatal Intensive Care Unit (NICU) through implementation of a multidisciplinary guideline and pharmacy-driven iNO stewardship.

**RESEARCH QUESTION OR HYPOTHESIS:** Does implementation of a standardized iNO weaning guideline with pharmacy-driven iNO stewardship reduce utilization of iNO in the NICU?

**STUDY DESIGN:** Single-center, non-randomized study comparing a retrospective control group to a prospective cohort after implementation of an iNO weaning guideline and stewardship.

**METHODS:** All infants who received iNO in the NICU during the study timeframe were eligible for inclusion. The primary outcome was duration of iNO per course. Attempted iNO discontinuations that were restarted within 72 hours were counted as the same course.

**RESULTS:** A total of 47 courses of iNO occurred during the 10-month pre-guideline timeframe (January 1, 2017 through October 31, 2017) compared to 22 courses in the 6.5-month post-guideline timeframe (November 15, 2017 through May 31, 2018). The median iNO duration per course was 149 hours (IQR 73, 237) versus 67.5 hours (IQR 43, 139) in the pre-guideline and post-guideline groups, respectively (p=0.112). The median iNO utilization per month was 740 hours (IQR 534.5, 819.8) versus 466 hours (IQR 281.5, 583.8), respectively (p=0.065). Stewardship data revealed an incidence of iNO weaning when recommended per the guideline of 80.8%. Incidence of successful weaning was 61.9% (n=21 attempts), with 7 failures due to lack of compliance to the guideline and only 1 failure due to increased respiratory requirements.

**CONCLUSION:** Monthly and per course utilization of iNO has non-significantly decreased since initiation of an iNO weaning guideline and pharmacy-driven stewardship. Additional multidisciplinary education is needed to increase compliance with use of the weaning guideline, particularly continued progression of weaning overnight.

**339. Development of protein-specific analytical methodologies to evaluate compatibility of recombinant human (rh)igf-1/rhigfbp-3 with intravenous medications co-administered to neonates** *Nazila Salamat-Miller, Ph.D.*[1], Christopher McPherson, Pharm.D.[2], Benita Amsden, BS[1], Kerstin Rumpelmayr, Ph.D.[3], Paul A. Salinas, BS[4], Jennifer S. Chadwick, Ph.D.[5], Dongdong Wang, Ph.D.[5], Shiaw-Lin Wu, Ph. D.[5], Mark A. Turner, MBChB[6]; [1]Process Development, Formulation Development, Shire, Lexington, MA [2]Department of Pediatrics, Washington University, St. Louis, MO [3]Process Development & Technical Services, Shire, Vienna, Austria [4]Analytical Development, Shire,

Lexington, MA [5]BioAnalytix, Cambridge, MA [6]Institute of Translational Medicine, University of Liverpool, Liverpool, United Kingdom

**INTRODUCTION:** Chemical compatibility data are critical to decisions about which drugs can be co-administered with intravenous (IV) biologic drugs. Recombinant human (rh)IGF-1/IGFBP-3, a protein complex administered by continuous IV infusion, is being studied for the prevention of complications of prematurity.

**RESEARCH QUESTION OR HYPOTHESIS:** To assess potential incompatibilities, protein-specific analytical methodologies were developed to evaluate rhIGF-1/rhIGFBP-3 quality post-mixing with commonly used medications. Preliminary analysis of rhIGF-1/rhIGFBP-3 compatibility with caffeine citrate and ampicillin is reported.

**STUDY DESIGN:** Mixed samples and controls were prepared and analyzed using reversed-phase high-performance liquid-chromatography equipped with mass spectrometric detection (RP-HPLC-MS) and size-exclusion ultra-performance liquid chromatography (SE-UPLC).

**METHODS:** In vitro drug-drug mixing studies were performed with representative doses of rhIGF-1/rhIGFBP-3 mixed with either caffeine citrate or ampicillin to simulate potential clinical scenarios. The RP-HPLC-MS method was developed to identify and quantify modifications (e.g., oxidation) at ultra-low concentrations (~5 mg/mL) of rhIGF-1/rhIGFBP-3 post-mixing. The method was qualified for linearity, specificity, and recovery in a ~3–13 mg/mL concentration range. In addition, an SE-UPLC method was assessed for specificity and feasibility to confirm no high-molecular weight (HMW) species are formed post-mixing.

**RESULTS:** No increased levels of oxidation or aggregation of rhIGF-1/rhIGFBP-3 were observed post mixing with caffeine citrate, when tested with RP-HPLC-MS or SEC-UPLC. Acceptable recoveries for the mixed rhIGF-1/rhIGFBP-3 drug product were observed post mixing with caffeine citrate by both methods. In contrast, RP-HPLC-MS revealed a lower drug product recovery and an ampicillin-rhIGFBP-3 by-product for the ampicillin co-mixture. Neither oxidation of rhIGF-1/rhIGFBP-3 nor HMW species was observed with ampicillin.

**CONCLUSION:** Initial findings for these protein-specific methodologies to test compatibility of rhIGF-1/rhIGFBP-3 provided preliminary support for co-administration with caffeine and demonstrated a potential risk for ampicillin. These methods are relevant to the detection of potential protein modifications under representative clinical administration scenarios.

**340. Merit project: etoposide hypersensitivity in pediatric patients**

*Winifred Stockton, Pharm.D., BCPPS*[1], Theresa Nguyen, Pharm.D., BCPPS[1], Lishi Zhang, MS[2], Thomas Dowling, Pharm.D., Ph.D., FCCP[3]; [1]Children's Hospital of Orange County, Orange, CA [2]University of California, Irvine, CA [3]Ferris State University, Big Rapids, MI

**INTRODUCTION:** Etoposide is critical in treating many pediatric cancers, although hypersensitivity reactions can be severe and treatment-limiting. The FDA-approved product label describes etoposide hypersensitivity in 2% of patients; however, higher rates of up to 51% in pediatrics have been reported. Hypersensitivity data for etoposide phosphate, a newer product, is lacking. The primary objective was to assess hypersensitivity incidence within four months of initial dose. Secondary objectives included evaluation of potential risk factors for initial hypersensitivity and strategies to prevent recurrence.

**RESEARCH QUESTION OR HYPOTHESIS:** Pediatric patients experience less hypersensitivity with etoposide phosphate than etoposide.

**STUDY DESIGN:** Retrospective cohort study

**METHODS:** Pediatric patients who received their initial etoposide phosphate or etoposide dose between August 2012 and July 2017 were included. Group assignment was based upon initial formulation administered. The primary outcome was documentation of initial hypersensitivity in the medical record. Potential risk factors evaluated for association with hypersensitivity included age, allergies, dose, infusion rate, infusion concentration, and premedication.

**RESULTS:** Of 246 patients, hypersensitivity reactions occurred in 5 of 54 patients (9.3%) in the etoposide phosphate group and 52 of 192 patients (27.1%) in the etoposide group (p=0.0061). Among patients who received etoposide, the mean initial infusion rate was 64.6 ±40.9 mg/m$^2$/hour for patients with hypersensitivity and 49.5 ±33.4 mg/m$^2$/hour without hypersensitivity (p=0.0886). Etoposide phosphate infusion rate was not associated with hypersensitivity. Recurrent hypersensitivity occurred in 1 of 9 patients (11.1%) who received etoposide desensitization and 1 of 38 patients (2.6%) who changed formulation to etoposide phosphate.

**CONCLUSION:** Etoposide is associated with more hypersensitivity than etoposide phosphate in pediatric patients. There is a trend of higher infusion rate in patients with etoposide hypersensitivity, but not etoposide phosphate. Differences in hypersensitivity incidence and infusion rate influence indicate a formulation-effect. For many patients, etoposide hypersensitivity recurrence may be prevented by changing to etoposide phosphate formulation.

**341. Comparison of cefotaxime versus ceftazidime for neonatal sepsis**

*Payal Patel, Pharm.D.*[1], Deborah Bondi, Pharm.D.[1], Palak Bhagat, Pharm.D.[1], Allison Bartlett, MD[2]; [1]Department of Pharmacy Services, University of Chicago Medicine, Chicago, IL [2]Chicago, IL

**INTRODUCTION:** Empiric management of suspected sepsis in the Neonatal Intensive Care Unit (NICU) commonly includes gentamicin plus either ampicillin or an antistaphylococcal agent. A third-generation cephalosporin may be added in patients who are critically ill, have poor renal function, or for improved meningitis coverage. The preferred agent is cefotaxime, however, due to a national drug shortage, ceftazidime has been recommended in its place for infants less than 2 months old.

**RESEARCH QUESTION OR HYPOTHESIS:** The incidence of culture-positive late onset sepsis and multi-drug resistant organisms (MDROs) is increased with the use of ceftazidime compared to cefotaxime in neonates.

**STUDY DESIGN:** This was a single-center, retrospective cohort study of all NICU patients who received at least 24 hours of cefotaxime or ceftazidime within pre-specified time frames between April 1, 2015 and August 1, 2017, determined by our institutional shortage status.

**METHODS:** Each subject was included only once based on the first time they received the study antibiotic. Subjects were excluded if they received the alternate antibiotic for greater than 24 hours during the same admission.

**RESULTS:** A total of 101 subjects were included in the final analysis (cefotaxime n=43; ceftazidime n=58). Median gestational ages were significantly different between groups (32.3 [IQR 26.9, 37.4] versus 28.1 [IQR 25, 36.6] weeks, respectively, p<0.05). Results showed a non-statistically significant increased incidence of culture positive late-onset sepsis with the use of ceftazidime compared to cefotaxime (2.3% cefotaxime versus 17.2% ceftazidime, adjusted p=0.48), MDRO infections (0% versus 5.2%, respectively, p=0.26), culture-negative sepsis (20.9% versus 37.9%, respectively, p=0.07), and necrotizing enterocolitis (2.3% versus 22.4%, respectively, adjusted p=0.067). MDRO infections included extended-spectrum beta-lactamase producing *Escherichia coli* and *Pseudomonas aeruginosa*. No differences were noted for mortality or postmenstrual age at discharge.

**CONCLUSION:** Further multi-center research is warranted to assess the effect of this drug shortage on the neonatal population.

**342. Reliable administration of oral drug in young patients** Adeline Chanat, Pharm.D. Student[1], Guillaume Binson, Pharm.D.[1], Karen Waton, Pharm.D.[2], Karine Beuzit, Pharm.D.[3], *Antoine Dupuis*, *Pharm. D.*, *Ph.D.*[1]; [1]Pharmacy Department, University Hospital of Poitiers, POITIERS, France [2]Pharmacy Department, University Hospital of Lille, LILLE, France [3]Pharmacy Department, University Hospital of poitiers, POITIERS, France

**INTRODUCTION:** In pediatric care units, most of oral medicines are not suitable for young patients regarding their galenic form or drug dosage. In order to figure out these issues, nursing staff use to modify the commercially available medicine by splitting, crushing and/or diluting. Another way to administrate the required treatment is to use pharmacy-compounded drug such as appropriate dosage capsules or oral suspensions/solutions.

**RESEARCH QUESTION OR HYPOTHESIS:** To compare the accuracy of the dose when a drug is administrate orally via three different methods: (i) nurse modification of commercially available tablet (ii) pharmacy-compounded capsule (iii) pharmacy-compounded oral suspension.

**STUDY DESIGN:** Spironolactone was chosen in order to assess the accuracy of the three different methods used for the administration of a 6.25 mg dose.

**METHODS:** The amount of spironolactone actually administrate according to nurses practices from the pediatric care units of an academic hospital was assessed (n=30). The amount of spironolactone was determined using a validated HPLC-UV analytical method. Similarly, the exact amount of spironolactone administered for the same expected dose using pharmacy-compounded capsules (n=30) or oral suspensions (n=30) was determined.

**RESULTS:** The accuracy of the dose of spironolactone administrate via nurse practices was 72.0±10.5 % on average. The accuracies of the administered dose using the other methods were 27.5±42.8 % and 95±1.6 % for compounded capsules and compounded suspensions, respectively.

**CONCLUSION:** This study demonstrates that the oral dose actually administered in young patients differs in a wide range according to the method used. Nurse practices as well as the pharmacy compounded capsules lead to inaccurate dose administration likely due to the loss of drug especially with hydrophobic molecule such as spironolactone. According to these data, pharmacy-compounded oral suspension is the best option to administrate efficiently and accurately a drug when commercial medicine is not available.

**343. Vancomycin dosing and trough concentrations in pediatric patients undergoing extracorporeal membrane oxygenation** *Sook Hee An, Ph. D.*[1], Eun Mi Lee, MS[2], Jae Youn Kim, Ph.D.[2], Hyesun Gwak, Ph. D., Pharm.D.[3]; [1]College of pharmacy, Wonkwang University, Iksan, Korea, Republic of (South) [2]Department of Pharmacy, Asan Medical Center, Seoul, Korea, Republic of (South) [3]College of Pharmacy & Division of Life and Pharmaceutical Sciences, Ewha Womans University, Seoul, Korea, Republic of (South)

**INTRODUCTION:** The effects of extracorporeal membrane oxygenation (ECMO) on the pharmacokinetics of vancomycin in pediatric patients have been studied, but most studies had small sample sizes and conflicting results have been reported. The optimal dosing regimen of vancomycin for pediatric patients during ECMO was not established.

**RESEARCH QUESTION OR HYPOTHESIS:** To evaluate the dosing and trough concentrations of vancomycin in pediatric patients undergoing ECMO.

**STUDY DESIGN:** Single center, retrospective, cohort study using therapeutic drug monitoring data from August 2006 to May 2013

**METHODS:** A retrospective medical records review identified all pediatric patients who received vancomycin during ECMO support and for whom vancomycin trough concentrations were documented. Patients receiving ECMO in less than 24 hours were excluded. The primary endpoint was the percentage of trough concentrations of vancomycin within target therapeutic range. The secondary endpoint was the total daily dose of vancomycin used for a patient to maintain target therapeutic range of trough level. Factors influencing vancomycin trough concentrations were also assessed by multiple linear regression.

**RESULTS:** A total of 274 trough concentrations of vancomycin from 96 patients were included in the analysis. Patients had a median age of 10 weeks (0-18 years) and a median weight of 4.1 kg (2-84 kg). Trough concentration of vancomycin was within the target range of 10-20 mg/L in 40.9% of cases. The percentage of vancomycin trough concentrations of >20 mg/L was 25.5%. The median total daily dose used to achieve therapeutic trough concentrations was 20 mg/kg/day. Estimated glomerular filtration rate was significantly associated with trough levels of vancomycin (adjusted $R^2$=0.050, p<0.001).

**CONCLUSION:** Current dosing regimen of vancomycin was not appropriate to maintain target trough concentration of 10-20 mg/L in pediatric patients on ECMO. Careful therapeutic drug monitoring for

dosing adjustment of vancomycin is required for the effective and safe treatment of pediatric patients receiving ECMO.

**344. Evaluation of drug administration through enteral feeding tubes in pediatric patients of a high complexity hospital** *Claudio Gonzalez Sr., MSc Candidate*[1], Roxana Santana, Pharm.D.[1], Felipe Lagos, Pharm. D. Student[1], Lorena Contreras, Midwife[1], Isadora Bezares, Nurse[1]; [1]Hospital Dr. Exequiel Gonzalez Cortes, Santiago, Chile

**INTRODUCTION:** The drugs administration by enteral feeding tubes (EFT) is a common practice in hospitalized patients, increasing the risk of medication errors (ME). Pediatric patients are susceptible to efficacy and safety problems when this administration route is used, due to wrong administration techniques and the lack of adequate dosage forms.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the percentage of errors in the process of drugs administration by EFT in pediatric patients of a high complexity hospital?

**STUDY DESIGN:** A prospective, descriptive quantitative study of a non-random sample.

**METHODS:** The procedures of drugs preparation and drugs administration through EFT were observed by systematic observation. We made an adaptation of the ME classification of the NCC MERP group to categorize the ME detected. We considered as ME to any error occurred during the process of dose calculations, crushing, dilution and administration technique.

**RESULTS:** 104 preparation and administration process of 39 different drugs prescribed to 20 different patients were observed; 79.6% of them had at least one error. In total there were 117 errors, 36 of preparation and 76 of administration. 61.1% of the total errors correspond to the omission of the tube flushing, 19.7% to errors in the choice of dosage form, 7.7% to wrong fractionation techniques and 4.3% to omission of the drug administration. Whit this results, about 190 drugs monographs were made, with administration recommendations, incompatibilities and interactions data.

**CONCLUSION:** This research allowed us to evaluate and characterize the errors detected in the preparation and administration of drugs by EFT. Eight of ten processes present at least one error and the most frequent problem is the omission of the tube flushing. The implementation of a drug administration through EFT guide will reduce the risks associated with the nursing staff practices. However, it is necessary to carry out future studies to evaluate the impact of the implementation of this guide.

**345. An evaluation of inhaled pharmacotherapy use in patients hospitalized for asthma indications** *John Harris, Pharm.D.*, J. Andrew Woods, Pharm.D., Zack Inge, Pharm.D. Candidate; Wingate University School of Pharmacy, Wingate, NC

**INTRODUCTION:** In 2013, the total cost of asthma in the United States was estimated to be $81.9 billion including absenteeism. From 2008-2013, absenteeism costs approximated $3 billion in losses. Annual incremental cost per person associated with asthma hospitalization was $529. (*Ann Am Thorac Soc* 2018;15(3):348.) One approach to decrease costs associated with absenteeism and hospitalization is to decrease the length of stay (LOS). Based on findings in an inhaled pharmacotherapy review in hospitalized patients with chronic obstructive pulmonary disease hypothesizing missed scheduled inhaled medications may increase LOS (*Southern Medical Journal* 2011;104(11):742.), we hypothesized missing inhaled scheduled medication administrations in hospitalized patients with asthma may increase LOS.

**RESEARCH QUESTION OR HYPOTHESIS:** Does missing scheduled inhaled pharmacotherapies correlate to increased LOS in hospitalized patients aged 2-17 years with asthma in 2016?

**STUDY DESIGN:** A retrospective review.

**METHODS:** Inhaled pharmacotherapies included short-acting beta-agonists, inhaled corticosteroids (ICS), and combinations of ICS with long-acting beta-agonists. Information collected included: patient age, data and time of patient admission and discharge and order start and end, pharmacotherapy ordered, formulation, number of inhalations and dose per scheduled administration, and number of scheduled and missed doses. Wilcoxon Mann Whitney tests and Spearman correlations were calculated using SAS 9.3 TS Level 1M2.

**RESULTS:** LOS (mean=49.5 hours) for patients who missed ≥1 administration (n=63, mean score=92.6) and those who did not (n=84, mean score=60.1) differed significantly ($p<0.0001$). The Spearman coefficients for age (mean=7.3 years), number of missed administrations (mean=0.78), percentage of missed administrations (mean=3.2%), number of scheduled administrations (mean=21.5), and percentage of scheduled administrations (mean=96.8%) with LOS were: 0.1172 ($p=0.1577$), 0.40039 ($p<0.0001$), 0.26633 ($p=0.0011$), 0.90887 ($p<0.0001$), and -0.26633 ($p=0.0011$) respectively.

**CONCLUSION:** The largest correlation of LOS was the number of scheduled administrations given followed by the number of administrations missed. The percentage of administrations given had a negative correlation to LOS emphasizing the importance of administering the majority of inhaled pharmacotherapies.

## PERI-OPERATIVE CARE

**346. Post-anesthesia unit length of stay following rocuronium-induced neuromuscular blockade reversal with sugammadex compared to neostigmine** *Calvin Ice, Pharm.D., BCSP, BCCCP*[1], Olivia Carnagie, BS, Pharm.D.[2], Jessica Parker, MS GStat[3], Kari Vavra, Pharm.D., BCPS[2], Nicholas Watson, MD[4]; [1]Department of Pharmacy Services, Spectrum Health, Grand Rapids, MI [2]Ferris State University College of Pharmacy, Grand Rapids, MI [3]Spectrum Health, Grand Rapids, MI [4]Anesthesia Practice Consultants, PC, Grand Rapids, MI

**INTRODUCTION:** Sugammadex has demonstrated faster reversal of rocuronium-induced neuromuscular blockade (NMB) when compared to neostigmine in clinical trials; however, there remains a paucity of data demonstrating this faster reversal can impact the amount of time patients spend in the post-anesthesia unit (PACU) or other periprocedural areas.

**RESEARCH QUESTION OR HYPOTHESIS:** PACU length of stay will differ between patients who received postoperative sugammadex versus those who received neostigmine.
**STUDY DESIGN:** Retrospective before-after clinical study
**METHODS:** Adults who received neostigmine in May 2016 or sugammadex in November 2016 for reversal of NMB following outpatient surgery were evaluated. Patients were excluded if they had a history of chronic kidney disease, received anesthesia in a non-OR setting, or did not receive rocuronium. A sample size of 252 patients per group was deemed necessary for 80% power to detect a 20% change in the primary endpoint of PACU length of stay. Secondary endpoints included OR duration, intubation length, PACU complications, and other peri-procedure discharge timeframes.
**RESULTS:** During the study timeframes, 1374 adults received neostigmine or sugammadex, of which 847 patients were excluded. A total of 527 adults were included (262 neostigmine, 265 sugammadex), and there were no significant differences in age, surgery type, or other demographic variables. Median PACU length of stay for neostigmine was 51 minutes [25$^{th}$, 75$^{th}$ percentile 38, 71] compared to 52 minutes [25$^{th}$, 75$^{th}$ percentile 39, 68], p=0.71. There were no significant differences in OR length, intubation length, or time to periprocedure discharge. Patients who received sugammadex were extubated slightly faster from the time of reversal agent dose compared to those who received neostigmine (median 13 minutes [25$^{th}$, 75$^{th}$ percentile 9, 19] compared to 15 minutes [25$^{th}$, 75$^{th}$ percentile 10, 21], p=0.0085).
**CONCLUSION:** Reversal of rocuronium-induced NMB with sugammadex compared to neostigmine did not decrease the length of stay in PACU or other periprocedural areas.

**347. Ketamine tolerance in Sprague-Dawley rats following chronic ketamine, morphine, or cocaine administration** Samantha Gerb, DVM[1], James Cook, Ph.D.[2], *Alexandria Gochenauer, Pharm.D. Candidate*[3], Camille Young, BS[1], Linda Fulton, DVM[1], Andrew Grady, DVM[1], Kevin Freeman, Ph.D.[2]; [1]Center for Comparative Research, University of Mississippi Medical Center, Jackson, MS [2]Division of Neurobiology and Behavior Research, Department of Psychiatry and Human Behavior,, University of Mississippi Medical Center, Jackson, MS [3]School of Pharmacy, University of Mississippi, Jackson, MS
**INTRODUCTION:** Approximately 1 in every 10 Americans use illicit drugs, leading to cross-tolerance of illicit and anesthetic drugs, potentially complicating anesthetic plans. Patients identified as having a history of illicit drug use have anecdotally received higher doses of anesthetics, including ketamine.
**RESEARCH QUESTION OR HYPOTHESIS:** Does chronic administration of ketamine, morphine, or cocaine have an effect on ketamine's ability to produce anesthesia?
**STUDY DESIGN:** Randomized control trial in which male Sprague-Dawley rats were randomly allocated to Study 1 (low dose ketamine, high dose ketamine, or saline) or Study 2 (low dose morphine, high dose morphine, low dose cocaine, high dose cocaine, or saline).
**METHODS:** Rats were randomized to daily intraperitoneal injections of ketamine (32 mg/kg or 100 mg/kg; Study 1), morphine (3.2 mg/kg or 5.6 mg/kg; Study 2), or cocaine (3.2 mg/kg or 10 mg/kg; Study 2) for 14 consecutive days. All study groups were then tested on the following day for ketamine-induced anesthesia using a cumulative-dosing procedure and anesthetic depth was evaluated (32-320 mg/kg). Pre-surgical anesthesia (Plane III), in which rats show loss of their righting reflex, was the target level for full effect.
**RESULTS:** In Study 1, significant differences were detected between pretreatment groups in the dose-response curves, $X^2(2) = 6.07$, $p < 0.05$ and in time from administration of the last ketamine dose delivered during anesthetic testing to recovery, $F(2, 18) = 10.24$, $p < 0.05$. In Study 2, dose-response curves were statistically significant between pretreatment groups $X^2(4) = 12.35$, $p < 0.05$. Post-hoc comparisons of dose-response curves only detected significant differences between the saline and high dose morphine groups, $p = 0.0028$.
**CONCLUSION:** The results suggest that ketamine's clinical effectiveness as an anesthetic will vary as a function of its history of use and that a history of chronic opioid use may reduce ketamine's anesthetic effectiveness.

## PHARMACOECONOMICS/OUTCOMES

**348. Economic outcomes associated with an investigational drug service within a veterans affairs health care system** *Jamie Brown, Pharm.D., BCPS, BCACP*, Sherin Jacob, Pharm.D., BCPS, Frank Tillman III, Pharm.D. Candidate and Sara Britnell, Pharm.D., BCPS; Pharmacy Service, Durham VA Health Care System, Durham, NC
**INTRODUCTION:** Investigational Drug Services (IDSs) provide many valuable services to investigators and institutions including investigational product management, dispensing, documentation, drug information consultation, study randomization and blinding, medication safety quality assurance, and regulatory compliance. The economic value of an IDS is often assessed by revenue generation. However, drug cost avoidance may also contribute when a research subject receives sponsor-provided treatment in place of a medication that would have been otherwise funded by the institution.
**RESEARCH QUESTION OR HYPOTHESIS:** The primary objective of this assessment is to determine the cost avoidance associated with an IDS over two years. Secondary objectives include determining total revenue charges, assessing investigator cost savings for fee-waived studies, and differentiating the economic value of individual therapeutic research areas.
**STUDY DESIGN:** Retrospective record review
**METHODS:** Study protocols and dispensing records for all investigational drug studies conducted at the institution were reviewed from January 1, 2016 to December 31, 2017. Medical center contract acquisition costs were used to calculate cost avoidance. Revenue was determined by totaling fees charged by the IDS. Investigator cost savings was calculated by totaling revenue not collected due to waived fees. Descriptive statistics were used for all assessments.
**RESULTS:** A total of 23 unique protocols and 1370 dispensations were recorded during the study period. Of these, 9 protocols contributed to a total cost avoidance of $482,627.33. Fifteen protocols

resulted in a total revenue of $16,822.00 and eight protocols totaled $54,200.00 in waived revenue fees. Oncology, infectious diseases, and cardiovascular protocols resulted in the highest cost avoidance and revenue; mental health and pain management protocols were associated with the highest totals for waived fees.

**CONCLUSION:** Over a 2-year period, the IDS was associated with substantial economic value to the institution through cost avoidance, revenue generation, and investigator cost savings. The economic benefit varied by therapeutic category.

**349. Patients may not be willing to pay for line extension products: results of a survey in Singapore** *Yen Ping Lim, MClinPharm*, Paul Anantharajah Tambyah, MD, Bee Choon Christine Teng, MSc(ClinPharm); National University of Singapore, Singapore, Singapore

**INTRODUCTION:** Line extension products (e.g. fixed-dose combinations, modified-release formulations) are widely used to prolong brand lifecycles. These preparations are generally more expensive than parent drugs while offering limited advantages (e.g. convenience, compliance). Hearing patients' voices are important for hospital formulary management committees to make effective decisions.

**RESEARCH QUESTION OR HYPOTHESIS:** Patients may not be willing to pay for line extension products.

**STUDY DESIGN:** Anonymous surveys.

**METHODS:** From mid-February to mid-March 2018, patients waiting to collect medications from all outpatient pharmacies in National University Hospital, Singapore were approached for the survey. Definitions of line extension products were explained with photographs of common preparations shown.

**RESULTS:** A total of 202 adults (mean 46.0 years old; 53.0% females; 57.4% Chinese) completed the survey. 26.2% or 25.7% of cases had high school education or bachelor's degree, their mean monthly household income was SG$7,106 (US$5,327). 46.5% of them received government subsidies for their medications, but 57.4% still found their medications expensive. They paid an average of SG$57 (US$43) monthly after subsidies for a mean of 2.5 chronic medications. 26.2% of participants took at least one line extension product, 84.9% found the products expensive. Patients were willing to pay more (average 17.8% higher price) for injectable line extension products than for dermatological, inhalational, ophthalmic and oral line extension products (9.8%, 9.7%, 9.6% and 9.3% higher prices versus parent products, respectively). Patients were willing to pay less (only 6.5% higher price) for branded products, if generics were available. Nearly half (49.5%) of respondents did not know about line extension products and the price differences. 45.5% of them did not report being given a choice between these or parent products.

**CONCLUSION:** Most line extension products with 10% higher prices should probably not be stocked to minimize wastage, as patients seemed reluctant to pay for them. Prescribers and pharmacists should enquire about patients' preferences for parent or line extension products.

**350. The economic impact of substandard and falsified antimalarial medications in Nigeria** *Sarah Beargie, BS*[1], Daniel Evans, MScGH[1], Sachiko Ozawa, Ph.D., MHS[2]; [1]Division of Practice Advancement and Clinical Education, UNC Eshelman School of Pharmacy, University of North Carolina, Chapel Hill, NC [2]Department of Maternal and Child Health, UNC Gillings School of Global Public Health, Univeristy of North Carolina, Chapel Hill, NC

**INTRODUCTION:** Substandard and falsified medications create significant risks to global health with far-reaching consequences in low- and middle-income countries. Nearly one in five antimalarials circulating in developing countries are substandard or falsified. Poor quality antimalarials pose a health threat to patients and accelerate the spread of drug resistance. We assessed their impact in Nigeria, where malaria is endemic and poor quality medications are commonplace.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the health and economic impact of substandard and falsified antimalarials on children under five in Nigeria?

**STUDY DESIGN:** We developed a dynamic agent-based SAFARI (Substandard and Falsified Antimalarial Research Impact) model using NetLogo to capture the impact of antimalarial use in Nigeria.

**METHODS:** The model simulated children with background characteristics, malaria infections, patient care-seeking, disease progression, treatment outcomes, and incurred costs. Using scenario analyses, we simulated the impact of substandard and falsified medicines, antimalarial resistance, as well as possible interventions to improve the quality of treatment, reduce stock-outs, and educate parents about antimalarial quality.

**RESULTS:** We estimated that poor quality antimalarials are annually responsible for 8,300 deaths among those who sought care and $815 million in costs in Nigeria. If drug resistance develops, we simulated that current costs of malaria could increase by $558 million. Furthermore, our scenario analyses demonstrated that possible interventions – such as removing stock-outs in private facilities, having only ACTs available for treatment, and patient education to reject non-ACT treatments – can save hundreds of millions in costs annually to reduce the burden of malaria in Nigeria.

**CONCLUSION:** The results highlight the significant health and economic burden of poor quality antimalarials in Nigeria and the impact of potential interventions to counter them. In efforts to reduce the burden of malaria and prevent antimalarials from developing resistance, policymakers and donors should examine and implement interventions to increase utilization of ACTs and reduce the impact of ineffective and harmful antimalarials.

**351. The economic impact of the opioid epidemic on liver transplantation and readmissions** *Lytani Wilson, MD, MPH*; Department of General Surgery, Medical University of South Carolina, Charleston, SC

**INTRODUCTION:** Opioid abuse and dependence has been associated with increased readmissions in major surgeries, however the impact of opioid use on readmissions after liver transplant has been limited.

**RESEARCH QUESTION OR HYPOTHESIS:** We hypothesized that opioid experienced liver transplant recipients would have higher readmission rates than opioid naïve liver transplant recipients.

**STUDY DESIGN:** This was a 6-year, retrospective, single-center cohort study of liver recipients transplanted between 1/2010 and 9/2016.

**METHODS:** Data was collected through retrospective chart review; patients were divided into Opioid Experienced (OE) and Opioid Naïve (ON) cohorts and analyzed for differences in readmission rates. The primary endpoint was readmission at 1 year. Secondary endpoints included readmissions at 30- and 90-days, number of 1-year readmissions, total readmission hospital days, direct costs of 1-year readmissions, preventability of readmissions, and causes of readmissions. Dichotomous data was analyzed using Chi Square or Fisher's Exact, when appropriate, and continuous data was analyzed using Student's t-test or Mann Whitney U, where appropriate. A p-value of $< 0.05$ was considered statistically significant (SPSS, v24.0).

**RESULTS:** Of the 446 liver transplants included in this study, 185 (41%) were OE and 261 (59%) were ON. OE patients were less likely to be working at the time of transplant (17% vs 24%, p=0.07) and more likely to be taking benzodiazepines (18% vs 7%, p<0.01). There were no differences in readmission rates, hospital days, or preventability. Readmission causes did not differ statistically, although there was a trend towards more infection-related readmissions in the OE cohort (26% vs 9%, p=0.05).

**CONCLUSION:** Pre-transplant opioid use was not associated with readmissions within 1 year after transplant. Further studies are warranted to clarify this and to investigate differences in causes of readmission.

**352. Racial and regional disparities in outcomes among veterans initially adherent to oral antidiabetic therapies** *Justin Gatwood, Ph.D., MPH*[1], Marie Chisholm-Burns, Pharm.D.[2], Robert Davis, MD[3], Fridtjof Thomas, Ph.D.[4], Praveen Potukuchi, MS[2], Adriana Hung, MD[5], Csaba Kovesdy, MD[6]; [1]Clinical Pharmacy and Translational Science, University of Tennessee College of Pharmacy, Nashville, TN [2]University of Tennessee Health Science Center, Memphis, TN [3]Department of Pediatrics, University of Tennessee Health Science Center, Memphis, TN [4]Department of Preventive Medicine, University of Tennessee Health Science Center, Memphis, TN [5]VAMC Tennessee Valley Health System, Nashville, TN [6]Memphis VA Medical Center, Memphis, TN

**INTRODUCTION:** The importance of medication adherence has been well-established among patients with diabetes; however, such adherence may not guarantee consistently improved health outcomes.

**RESEARCH QUESTION OR HYPOTHESIS:** To what extent do differences in health outcomes vary by geography and race among US veterans who are adherent to their oral antidiabetic (OAD) regimen?

**STUDY DESIGN:** Retrospective cohort study

**METHODS:** This analysis involved 83,625 US veterans with type 2 diabetes and new to OAD therapy between 2002-2014. Patients initially adherent to OADs (first-year proportion of days covered ≥ 80%) were identified and followed for up to 5 years. The incidence of and risk for macrovascular or microvascular complications, hospitalization, or death were assessed using negative binomial and Cox proportional hazards models to identify geographical and racial differences.

**RESULTS:** Nearly all rates of outcomes differed significantly between Non-Hispanic Whites and Blacks, those residing in urban versus rural areas, and those from different regions of the country, with nearly all of the highest rates in either the Midwest and Western states. For Non-Hispanic Blacks, the rate of death was half that compared to Non-Hispanic Whites (6.5 [95% CI: 5.8-7.2] versus 13.3 [95% CI: 12.9-13.8], p<0.0001). Adjusted survival analyses indicated the highest event hazard for Non-Hispanic Blacks was for retinopathy (HR: 1.5; 95%CI: 1.43-1.60), and for rural residents was for neuropathy (HR: 1.06; 95% CI: 1.03-1.10). Compared to the Northeast, all other regions had higher adjusted hazards for a cardiovascular event (myocardial infarction or angina), chronic kidney disease, and all-cause inpatient admissions: highest values in the West (HR: 1.7; 95% CI: 1.35-2.06), South (HR: 1.2; 95% CI:1.13-1.26), and West (HR: 1.4; 95% CI: 1.28-1.48), respectively. Adjusted models with race and region interactions showed more regional differences among Non-Hispanic Blacks than Non-Hispanic Whites.

**CONCLUSION:** Subgroups of the United States may be prone to different rates of diabetes-related outcomes even among those exhibiting evidence of medication adherence.

**353. Cost-effectiveness of procalcitonin-guided antimicrobial therapy for suspected sepsis patients in the intensive care unit** Lo-mei Tsoi, BPharm[1], *Joyce You, Pharm.D., BCPS*[2]; [1]School of Pharmacy, The Chinese University of Hong Kong, Shatin, Hong Kong [2]School of Pharmacy, The Chinese University of Hong Kong, Shatin, New Territories, Hong Kong

**INTRODUCTION:** The incidence of antimicrobial resistance is increasing in the intensive care units (ICUs) of Hong Kong. Reducing the length of antimicrobial therapy in the ICU can potentially contain the emergence of multi-drug resistance. Procalcitonin (PCT) is a promising biomarker to shorten the use of antimicrobial agents.

**RESEARCH QUESTION OR HYPOTHESIS:** We aimed to analyze the cost-effectiveness of a PCT-guided algorithm for antimicrobial discontinuation in patients with suspected sepsis in ICU setting of Hong Kong.

**STUDY DESIGN:** Decision tree modelling from perspective of Hong Kong public healthcare provider.

**METHODS:** A decision tree model was designed to simulate outcomes of PCT-guided algorithm versus standard care on antimicrobial therapy discontinuation in ICU patients with suspected sepsis. Model outcomes included direct medical costs and quality-adjusted life-year loss (QALY loss). Model inputs were derived from the literature. Sensitivity analyses were conducted to examine robustness of base-case results.

**RESULTS:** In the base-case analysis, PCT-guided arm reduced cost (HKD113,680 versus HKD115,264; USD1=HKD7.8), and reduced the QALY loss (0.00505 vs 0.00517) when compared to the standard care

arm. One-way sensitivity showed the base-case results to be sensitive to the variation of length of stay (LOS) in ICU and relative reduction of LOS in PCT-guided care. Probabilistic sensitivity analysis found the PCT-guided arm to be preferred in 44.76% of 10,000 Monte Carlo simulations.

**CONCLUSION:** The cost-effectiveness of PCT-guided algorithm for antimicrobial discontinuation in ICU patients with suspected sepsis is highly subject to the LOS in ICU for suspected sepsis and the relative reduction of LOS associated with PCT-guided algorithm.

**354E. Cost-effectiveness of CPX-351 versus 7+3 regimen in the treatment of treatment-related acute myeloid leukemia (taml) or AML with myelodysplasia-related changes (MRC)** Anuraag Kansal, Ph.D.[1], Oscar Herrera-Restrepo, Ph.D.[1], Robert Leipold, Ph.D.[1], Robert J. Ryan, MS[2], Arthur C. Louie, MD[2], Karen C. Chung, Pharm.D., MS[2], *Kathleen Villa, MS*[2]; [1]Evidera, Bethesda, MD [2]Jazz Pharmaceuticals, Palo Alto, CA

Presented at the Annual Meeting of the American Society of Hematology (ASH), December 9-12, 2017, in Atlanta, Georgia, USA and the 14th Annual Conference of the Hematology/Oncology Pharmacy Association (HOPA), March 21-24, 2018.

**355E. An evaluation of interprofessional navigation services in high utilizers at a county tertiary teaching health system** *Taylor Horyna, Pharm.D.*[1], Rosalinda Jimenez, Ed.D., MSN, APRN, FNP-BC, PMHNP-BC[2], Linda McMurry, DNP, RN, NEA-BC[2], Dolores Buscemi, MD[3], Barbara Cherry, DNSc, MBA, RN, NEA-BC[2], Charles F. Seifert, Pharm. D., FCCP, BCPS[1]; [1]School of Pharmacy, Texas Tech University Health Sciences Center, Lubbock, TX [2]School of Nursing, Texas Tech University Health Sciences Center, Lubbock, TX [3]Internal Medicine Department, Texas Tech University Health Sciences Center, Lubbock, TX

Presented at the Seventeenth Annual Texas Tech Research Days, Amarillo, TX June 15, 2018.

**356. Assessment of time lapse associated with medication access through a manufacturer medication assistance program** *Thukim Phan, Pharm.D. Candidate*[1], Rajeev Subu, Bachelor of Science Candidate[1], Catherine Bourg Rebitch, Pharm.D., BCPS, BCACP[2], Rebecca Stone, Pharm.D., BCACP, BCPS[2]; [1]University of Georgia, Athens, GA [2]Department of Clinical and Administrative Pharmacy, University of Georgia College of Pharmacy, Athens, GA

**INTRODUCTION:** Manufacturer Medication Assistance Program(s) (MMAP) allow patients of low economic status to obtain high cost medications at no cost. MMAP ordering is often associated with significant delay(s), resulting in medication gaps.

**RESEARCH QUESTION OR HYPOTHESIS:** How long does it take to receive and initiate medication through a MMAP? Are there differences in MMAP time requirements when comparing medication type?

**STUDY DESIGN:** Retrospective, Cross-Sectional Study

**METHODS:** Patients who received a MMAP medication order between 2015-2017 at Mercy Health Center were included. Data was extracted from the electronic medical record, clinic pharmacy software, and MMAP order logs. Data included medication type, days to receive medication from manufacturer, and days between receipt and patient pick up. Descriptive statistics and ANOVA analyses were conducted using SPSS.

**RESULTS:** Analysis included 208 MMAP medication orders. Mean time to receive medication from manufacturer was 38.6±36.3 days, and there were no statistical differences in days between medication types (insulin 41.9±42.1 vs. inhalers 37.4±30.1 vs. other 33.6±29.3, p=0.393). Patient medication pick up data was available for a subset of 119 medication orders, and had a mean of 14.3±47 days between receipt from manufacturer and patient pick up. Overall mean time from ordering to patient pick up was 43.3±33.3 days.

**CONCLUSION:** The time between MMAP application submission and patient medication pick up is clinically significant. Average time to receive medication from the manufacturer exceeded 5 weeks. Average patient pick up time was two weeks, and likely complicated by patient transit issues, health literacy, and health care prioritization. Additional strategies to bridge medication gaps associated with MMAP are needed.

**357. Cost-effectiveness of office-based medication-assisted treatment for opioid use disorder in united states** Melika Fini, Pharm.D., Connie Yan, Pharm.D., Daniel Touchette, Pharm.D., MA, *Paul Stranges, Pharm.D.*; University of Illinois at Chicago College of Pharmacy, Chicago, IL

**INTRODUCTION:** Medication assisted treatments (MAT) are much more effective than psychotherapy alone at treating opioid abuse disorder. Several MAT options are available for office-based treatment of Opioid Use Disorder (OUD), though significant differences in medication costs leads to uncertainty whether these agents are an efficient use of scarce healthcare resources.

**RESEARCH QUESTION OR HYPOTHESIS:** This study evaluated the cost-effectiveness of office-based MAT (buprenorphine/naloxone (BUP-NX), extended-release buprenorphine (XR-BUP), buprenorphine subdermal implant (BUP-Implant), and extended-release naltrexone (XR-NTX)) for clinically stable patients with OUD from the insurer's perspective.

**STUDY DESIGN:** Pharmacoeconomic model

**METHODS:** A Markov model simulated treatment with MAT and patient transitions among mutually exclusive Markov states (continued treatment, relapsed on treatment, stopped treatment, died) and transition states (emergency visit, hospitalization). Treatment effectiveness, direct medical costs, and health-related utility were derived from clinical trials, observational trials, and public data. The primary outcome was incremental cost per quality-adjusted life year (QALY) gained at one year and a threshold of $150,000 per QALY gained. Deterministic and probabilistic sensitivity analyses were conducted.

**RESULTS:** BUP-NX was associated with lowest total costs ($11,063) but least QALYs (0.7605) compared to other treatment options (XR-

NTX $14,944, 0.7637 QALYs; BUP-Implant $15,427, 0.7730 QALYs; XR-BUP $20,085, 0.7764 QALYs). Compared with the next best options, incremental ratios were $348,803/QALY for BUP-Implant compared with BUP-NX and $1,380,130/QALY for XR-BUP compared with BUP-Implant. XR-NTX was correlated with higher cost and less effectivness compared to a combined strategy of BUP-Implant and XR-BUP. Outcomes were most sensitive to on and off treatment relapse probabilities.

**CONCLUSION:** This analysis demonstrated that from a third party payer perspective BUP-NX is the only cost-effective option for clinically-stable adults at a threshold of $150,000 per QALY gained. Only having one cost-effective option is problematic, potentially leaving no other treatment options for patients who do not tolerate BUP-NX.

## PHARMACOEPIDEMIOLOGY

**358. Effects of silymarin on cataract risk reduction in patients with chronic hepatic diseases a population-based retrospective cohort study** *Hui-Hsuan Lu, Bachelor's degree*[1], Li-Hsuan Wang, Ph.D[2]; [1]Department of Pharmacy, Chang Gung Memorial Hospital Linkou Branch, Tao-yuan, Taiwan [2]School of Pharmacy, College of Pharmacy, Taipei Medical University, Taipei, Taiwan

**Introduction**: Silymarin is an antioxidant and it is the commonly used flavonoid compound for the treatment of hepatic diseases worldwide due to its antioxidant, anti-inflammatory, and anti-fibrotic properties. The cataract is a clouding of the lens in the eye which leads to a decrease in vision. The pathogenesis of cataract is complex, one underlying causes of cataracts is an overproduction of oxidants. Due to insufficient clinical data regarding the silymarin effects on cataract risk. Therefore, we conducted a hypothesis-generating, retrospective study to assess the risk of cataract formation among chronic hepatic disease (CHD) patients treated with silymarin.

**RESEARCH QUESTION OR HYPOTHESIS:** Silymarin is an antioxidant and it might prevent cataract formation in CHD patients.

**STUDY DESIGN:** This is a retrospective study with 6 years follow up period. The medical records of two million subjects from 2001 to 2008 were provided by the Taiwan National Health Insurance Research Database.

**METHODS:** We use Cox proportional hazard ratio (HR) to compare the risk of cataract in CHD patients received silymarin (study group) and those did not receive silymarin (comparison group). HR were adjusted for possible confounding factors, including age, gender, hypertension, diabetes mellitus, hyperlipidemia, chronic renal disease, obesity, ocular trauma, tobacco use disorder, alcohol abuse, age-related macular degeneration, glaucoma and oral steroid use(> 90 days).

**RESULTS:** Among CHD patients, the mean age of study group (receiving silymarin) and comparison group (without receiving silymarin) are 47.07 ± 13.16 and 43.64 ± 14.30 years old, respectively. The occurrence rates of cataract between two groups are 13.61% and 12.11%, respectively. After adjusting for possible confounding factors, CHD patient receiving silymarin have about 10% reduction of cataract risk. The adjusted HR was 0.91 (95% CI, 0.87–0.95) for study group compared with comparison group

**CONCLUSION:** Our results demonstrated a decreased risk of cataract in CHD patients who used silymarin.

**359. The duration of treatment and factors associated with persistent asthma in children: a population-based cohort study** Tzu-Yu Lin, BS[1], *Yuk-Ying Chan, MS*[2], Dah-Chin Yan, MD[3], Chi-Hua Chen, MS[4]; [1]Department of Pharmacy, Taipei Chang Gung Memorial Hospital of the C.G.M.F., Taipei, Taiwan [2]Department of Pharmacy, Linkou Chang Gung Memorial Hospital, Linkou, Taiwan [3]Department of Pediatrics, Taipei Chang Gung Memorial Hospital, Taipei, Taiwan [4]Department of Pharmacy Administration, Linkou Chang Gung Memorial Hospital of the C.G.M.F, Taipei, Taiwan

**INTRODUCTION:** Current guidelines for persistent asthma call for initiation of daily long-term controller medication. Parents or caregivers of children with asthma do concern about the duration of therapy (DOT) will take.

**RESEARCH QUESTION OR HYPOTHESIS:** The aim of this study is to investigate the DOT and factors associated with this population.

**STUDY DESIGN:** We conducted a cohort study of patients whose birth day between 2000 and 2005 by using the Taiwan National Health Insurance Research Database.

**METHODS:** The patients with asthma diagnosis and ever received asthma-controller medication for over 3 months were included. The first day of receiving asthma-controller was defined as index date. The study endpoint is one-year medication-free period (MFP) which is defined as the interval of prescribing asthma-controller medication is more than one year. The patients with index date after 2011/1/1 or older than 12 year-old were excluded. The last follow-up time was 2013/12/31. Survival analysis and cox regression was conducted to analyze the DOT and associated factors.

**RESULTS:** . A total of 3456 cases were included. The overall median DOT was 334 days. The median DOT in patients of age <3, 3~<6 and 6~<12 year-old were 403.5, 396 and 256 days, respectively (log rank p <0.001). The cases with age over 3 were more likely to achieve one-year MFP than cases age under 3 (adjusted HR (aHR) =1.12 95%CI:1.03~1.22 for age:3~<6 year-old; aHR =1.38 95% CI:1.22~1.55 for age: 6~<12 year-old). The cases associated with atopic dermatitis(AD) or allergic rhinitis(AR) were less likely to achieve one-year MFP. (aHR=0.88 95%CI: 0.80~0.99 for AD; aHR=0.82 95%CI:0.82~0.95 for AR). Disease severity and sex show no relation to the study endpoint

**CONCLUSION:** We found about half of children with persistent asthma can achieve one-year MFP after receiving treatment for at least one year. The elder children seem to have shorter duration of treatment. The children associated with AD or AR need longer treatment.

**360. Antidepressant polypharmacy in privately insured patients with depression** *Trinh Nguyen, Pharm.D. Student*, Xinyue Liu, Ph.D., Almut

Winterstein, RPh, Ph.D., FISPE; Department of Pharmaceutical Outcomes and Policy, University of Florida College of Pharmacy, Gainesville, FL

**INTRODUCTION:** Antidepressant polypharmacy may increase clinical benefits for monotherapy-resistant patients with depression. However, same-class and potentially contraindicated antidepressant polypharmacy should be avoided, but little is known about their prevalence.

**RESEARCH QUESTION OR HYPOTHESIS:** This study aimed to estimate the prevalence of overall, same-class, and potentially contraindicated antidepressant polypharmacy in a national sample of privately insured patients using the Truven MarketScan Commercial Database.

**STUDY DESIGN:** Prevalence was estimated for six 2-year blocks from 2008 to 2014. Each block included patients aged 0-64 with ≥1 depression diagnosis in the first year and continuous insurance coverage throughout the block. Micromedex, Lexicomp, and Clinical Pharmacology identified five antidepressant classes and 23 potentially contraindicated combinations. The refill pattern method, requiring four alternating and overlapping pharmacy claims of two unique antidepressants, was used to identify polypharmacy at any time in each block.

**METHODS:** The prevalence of overall antidepressant use, overall polypharmacy, same-class polypharmacy, and potentially contraindicated polypharmacy was calculated for each two-year block. Multivariate logistic regression models examined the effects of block, gender, age, region, and psychiatric comorbidities on the prevalence of antidepressant polypharmacy.

**RESULTS:** An average of 657,691 patients with depression were identified in each block, and 78.8% received ≥1 antidepressant. Among all included antidepressant users, 21% received polypharmacy. Significant polypharmacy predictors were female gender, age, and most psychiatric comorbidities. Same-class combinations occurred in <1% of antidepressant users, with two SSRIs (2,471) and two SRAs (1,064) most commonly used. Likewise, use of potentially contraindicated combinations was rare (1.2%), with trazodone/venlafaxine (5,469), trazodone/fluoxetine (5,326), and trazodone/paroxetine (1,861) being most common. Predictors for these combinations were similar to those for overall polypharmacy.

**CONCLUSION:** This study clarifies antidepressant treatment patterns for patients with depression through a nationwide claims database analysis. While antidepressant polypharmacy was common, inappropriate combination use was rare. However, the use of inappropriate combinations in certain patient groups warrants further investigation to examine their effectiveness.

**361. The real-world effectiveness of glucagon-like peptide-1 receptor agonist treatment in patients with type 2 diabetes mellitus: multi-institutional cohort study in taiwan** *Yi-Hung Chen, MS*[1], Keng-Wei Lin, BPharm[1], Shih-Chieh Shao, MS[1], Yuk-Ying Chan, MS[2], Hui-Yu Chen, MS[1]; [1]Department of Pharmacy, Keelung Chang Gung Memorial Hospital, Keelung, Taiwan [2]Department of Pharmacy, Linkou Chang Gung Memorial Hospital, Linkou, Taiwan

**INTRODUCTION:** Clinical trials have proven the efficacy of glucagon-like peptide-1 receptor agonists (GLP-1 RA) with regard to glucose and weight lowering effects in patients with type 2 diabetes mellitus (T2DM). However, real-world evidence regarding the effectiveness of GLP-1 RA remains uncertain, especially in Asia.

**RESEARCH QUESTION OR HYPOTHESIS:** We investigate the effectiveness of GLP-1 RA on HbA1c and body mass index (BMI) in patients with T2DM.

**STUDY DESIGN:** Retrospective cohort study

**METHODS:** We conducted the study from May 2016 to May 2017 in four hospitals covering 8% of outpatients in northern Taiwan. We identified adult patients with T2DM who had newly initiated GLP-1 RA, including liraglutide or dulaglutide. We selected a random sample (n=300) from the original cohort (n=600) to perform medical chart reviews by comparing their HbA1c and BMI from baseline to 6-month treatment by per-protocol analysis. This study used paired-t test to determine the statistical differences before and after GLP-1 RA treatment at the alpha level of 0.05.

**RESULTS:** There were 236 patients who continued the use of GLP-1 RA over 6 months, with a mean age of 56.2±11.9 years; 58.5% were female and 67.0% were receiving liraglutide. Our final analysis incorporated data from 133 and 201 patients with complete records for BMI and HbA1c, respectively. At baseline, their mean BMI and HbA1c were 28.7±4.7 kg/m$^2$ and 9.6±1.7 mg/dl, respectively. After 6-month GLP-1 RA treatment, the mean changes in HbA1c and BMI were -1.0 mg/dl (95% CI: -0.8 ~ -1.2) and -0.4 kg/m$^2$ (95% CI: -0.2 ~ -0.6), respectively.

**CONCLUSION:** Our findings indicated significant lowering effects on HbA1c and BMI after 6-months of GLP-1 RA treatment in T2DM patients with higher HbA1c levels at baseline. These results are useful for further real-world studies of T2DM in Taiwan.

**362. Discontinuation of glucagon-like peptide-1 receptor agonists in patients with type 2 diabetes mellitus in taiwan** Keng-Wei Lin, BPharm[1], Yi-Hung Chen, MS[1], *Shih-Chieh Shao, MS*[1], Yuk-Ying Chan, MS[2], Hui-Yu Chen, MS[1]; [1]Department of Pharmacy, Keelung Chang Gung Memorial Hospital, Keelung, Taiwan [2]Department of Pharmacy, Linkou Chang Gung Memorial Hospital, Linkou, Taiwan

**INTRODUCTION:** Persistence of glucagon-like peptide-1 receptor agonists (GLP-1 RA) is important for type 2 diabetes mellitus (T2DM) patients. Understanding treatment discontinuations in real-world settings is crucial for the development of strategies to improve treatment outcome.

**RESEARCH QUESTION OR HYPOTHESIS:** What were rates and reasons for the discontinuation of GLP-1 RA in the treatment of T2DM in clinical practice in Taiwan?

**STUDY DESIGN:** Retrospective cohort study

**METHODS:** We analyzed the data of four hospitals covering 8% of outpatients in northern Taiwan from May 2016 to May 2017. We selected a random sample of half the adult patients diagnosed with T2DM who had newly initiated GLP-1 RA, such as liraglutide or dulaglutide. We investigated the discontinuation rates of GLP-1 RA during

the one-year follow-up period and reviewed the medical charts to determine the discontinuation reasons, including loss of follow-up, ineffectiveness, side effects, refused injections and unspecified reasons.

**RESULTS:** We identified 300 patients with mean age of 56.1 (±12.5) years; 55.7% were female and 64.7% received liraglutide. On average, the patients received 2.5 (±1.2) anti-diabetes agents before GLP-1 RA initiation with the mean baseline HbA1c of 9.5 (±1.7) mg/dL. We found 99 patients (33%) discontinued GLP-1 RA during the follow-up period. The most frequently specified reason for discontinuation was loss of follow-up (n=21, 21.2%), followed by side effects (n=14, 14.1%), ineffectiveness (n=13, 13.1%) and refused injections (n=13, 13.1%). GLP-1 RA was discontinued by 38.4% for unspecified reasons.

**CONCLUSION:** We found a high discontinuation rate for GLP-1 RA in clinical practice, raising concerns over poor persistence and possible treatment failure. Our study provides a foundation for the optimization of effectiveness of GLP-1 RA treatment in T2DM patients.

**363. Views of social media for educational use in healthcare** *Adam Pizzuti, Pharm.D. Candidate 2019*[1], Karan Patel, Pharm.D./MBA candidate 2019[1], Erin McCreary, Pharm.D., BCPS[2], Emily Heil, Pharm.D., BCPS AQ ID[3], Christopher Bland, Pharm.D., BCPS, FIDSA[4], Bryan Love, Pharm.D., BCPS-AQ ID[5], P. Brandon Bookstaver, Pharm.D., FCCP, BCPS[6]; [1]South Carolina College of Pharmacy – USC campus, Columbia, SC [2]University of Wisconsin Hospitals and Clinics (UW Health), Madison, WI [3]University of Maryland School of Pharmacy, Baltimore, MD [4]Clinical and Administrative Pharmacy, University of Georgia College of Pharmacy, Savannah, GA [5]Department of Clinical Pharmacy and Outcomes Sciences, University of South Carolina College of Pharmacy, Columbia, SC [6]Department of Clinical Pharmacy & Outcomes Sciences, University of South Carolina College of Pharmacy, Columbia, SC

**INTRODUCTION:** Approximately 75% of Americans who are online say they are influenced by information on social media. Social media has an increasing presence as a resource in healthcare practice and curriculums. The purpose of our research was to identify perceptions regarding use of social media as an educational tool for healthcare practitioners.

**RESEARCH QUESTION OR HYPOTHESIS:** What are the opinions of healthcare practitioners about social media as an educational tool?

**STUDY DESIGN:** Cross sectional survey

**METHODS:** This survey was administered to physicians, nurses, nurse practitioners, physician assistants, pharmacists, and healthcare administrators. The survey tool inquired on respondent's use/views of social media for educational purposes. It also addressed if social media access is allowed in the workplace. REDCap was used for survey development and survey responses were anonymous. The survey was distributed via email to four hospital systems and affiliated health science schools in Wisconsin, Maryland, Georgia, and South Carolina. The survey launched in January 22, 2018 and closed May 1, 2018.

**RESULTS:** The top three professional roles amongst respondents were nurses (n= 1113), pharmacists (n= 162), and administrators (n= 98). Facebook (n= 1304), Pinterest (n= 833), and Instagram (n= 795) were the top three social media platforms used. The majority (69.3%) of respondents agreed that social media can be used as an effective tool for educational purposes. Among participants who had social media platforms, 68.0% of them currently used it for educational purposes. Pinterest (36.9%), LinkedIn (36.7%), and Twitter (33.5%) were the most commonly used platforms for educational purposes. Fifty percent of respondents had limited or no access to social media at work, while 40% were unsure of their access.

**CONCLUSION:** A majority of participants from a variety of healthcare disciplines view social media as an effective source for education. The results from this study could be used to aid dissemination efforts of information to healthcare practitioners.

**364. Proton pump inhibitors and the risk of acute and chronic kidney disease: a retrospective cohort study** *Emily Hart, Pharm.D. Student*, Terry Dunn, Pharm.D., Steve Feuerstein, MS, David M. Jacobs, Pharm. D., Ph.D.; Department of Pharmacy Practice, University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY

**INTRODUCTION:** Proton pump inhibitors (PPIs) are a widely-used class of drugs and have been linked to acute kidney injury (AKI) and chronic kidney disease (CKD). Less is known about these relationships within a general population cohort.

**RESEARCH QUESTION OR HYPOTHESIS:** We hypothesize that PPI exposure is associated with an increased risk of AKI and CKD.

**STUDY DESIGN:** Two separate retrospective cohort studies were employed using data from a health maintenance organization including patients who were continuously enrolled for at least 12 months between July 1993 and September 2008.

**METHODS:** Patients aged ≥18 years, without evidence of pre-existing renal disease and initiated on PPI therapy were identified. Incidences of AKI and CKD were defined using documented ICD-9-CM codes or a glomerular filtration rate <60 ml/min after initiation of PPI therapy. AKI subjects were followed for up to 90 days (cohort 1) and CKD subjects required at least 1 year of follow-up data (cohort 2). Multivariable logistic regression models were used to adjust for differences between groups (SAS version 9.4).

**RESULTS:** In the AKI cohort, 93,335 subjects were included with 16,593 subjects exposed to PPIs. The incidence rate of AKI was higher in the PPI group than among controls (36.3 vs. 3.54 per 1000 person-years; p<0.0001). In adjusted models, PPI exposure was associated with an increased risk of AKI (aOR 4.35; 95% CI 3.14-6.04, p<0.001). In the CKD cohort, 14,514 subjects were exposed to PPIs within a sample of 84,600 subjects. The incidence rate of CKD was higher in patients exposed to PPIs (34.3 vs. 8.75 per 1000 person-years, p<0.0001) and in adjusted models, PPIs were associated with a higher

risk of CKD as compared to controls (aOR 1.20; 95% CI 1.12-1.28; p<0.001).

**CONCLUSION:** Our results suggest that PPI exposure is associated with an increased risk of developing AKI and CKD.

## PHARMACOGENOMICS/ PHARMACOGENETICS

**365. Role of TNFα antagonists in susceptibility to mycobacterial infection in association with genetic polymorphisms in Crohn's disease** *Ahmad Qasem, Pharm.D., MS*[1], Saleh Naser, Ph.D.[2]; [1]University of Central Florida, ORLANDO, FL [2]University of Central Florida, Orlando, FL

**INTRODUCTION:** Tumor Necrosis Factor alpha antagonists (anti-TNFα) have been widely used for Crohn's disease (CD). Although they may control CD symptoms initially, treatment response varies among patients, which seems to depend on single nucleotide polymorphisms (SNPs) in TNFα receptors superfamily 1A and 1B (*TNFRSF1A/B*). Most importantly, *M. tuberculosis* infection has been strongly associated with these medications, but no studies have elucidated the effects of anti-TNFα on CD associated with MAP (*Mycobacterium avium* subspecies *paratuberculosis*; a possible causative agent of CD).

**RESEARCH QUESTION OR HYPOTHESIS:** Genetic mutations in *TNFRSF1A* and *TNFRSF1B* influences MAP infection susceptibility and treatment response to anti-TNF.

**STUDY DESIGN:** 54 CD patients and 50 healthy controls were recruited to test MAP infection, genetic mutations, gene expression and treatment response, in addition to studying the effects of treatment *in vitro*.

**METHODS:** We studied the effects of recombinant inflammatory cytokines and anti-TNFα therapeutics on macrophages infected with MAP isolated from CD patient. We also tested the prevalence of MAP and the significance of nine SNPs in *TNFRSF1A* and *TNFRSF1B* from the blood of 54 CD and 50 healthy subjects.

**RESULTS:** Overall, 31/54 CD patients were infected with MAP compared to only 4/50 controls [OR = 15.5, 95% CI: 4.88-49.22, *P<0.05*]. Both PEGylated and non-PEGylated forms of anti-TNFα increased MAP viability by nearly 1.5 logs, while rTNFα reduced MAP survival in infected macrophages by 2.63 logs. Gene expression of *TNFα, IL-6*, and *IL-12* was between 1.5 to 3 folds higher following MAP or *M. tuberculosis* infection compared to other bacterial strains (*P*<0.05). Additionally, three SNPs (*TNFRSF1A:rs767455*, *TNFRSF1B:rs1061624* and *TNFRSF1B:rs3397*) were distributed significantly among CD patients. Both *TNFRSF1A:rs767455* and *TNFRSF1B:rs3397* downregulated their corresponding gene expression and induced susceptibility to MAP infection.

**CONCLUSION:** The study provides data about the safety of using anti-TNFα in CD, and predictions toward treatment response based on patient's pharmacogenomics.

**366. Hla-b*58:01 carrier status in the Minnesota Hmong: first in Hmong genotyping for prevalence of this biomarker of risk for severe cutaneous adverse reactions (scars) caused by allopurinol** *Kerui Peng, BS*[1], Youssef Roman, Pharm.D., Ph.D.[2], Kathleen Culhane-Pera, MD, MA[3], May Lo, Pharm.D.[4], Robert Straka, Pharm.D., FCCP[1]; [1]Department of Experimental and Clinical Pharmacology, College of Pharmacy, University of Minnesota, Minneapolis, MN [2]Pharmacy Practice Department, The Daniel K. Inouye College of Pharmacy, University of Hawaii, Honolulu, HI [3]West Side Community Health Services, St Paul, MN [4]Phalen Family Pharmacy, St Paul, MN

**INTRODUCTION:** Hmong, a unique Asian population, exhibit a 2-to-5-fold higher prevalence of gout and hyperuricemia compared to non-Hmong. Allopurinol – commonly used to manage gout – is associated with Severe Cutaneous Adverse Reactions (SCARs), which have up to a 25% mortality rate, costing an average $157,334 for inpatient care per event. *HLA-B*58:01* carrier status highly predicts the possible development of SCARs with sensitivity 0.78 (95% CI: 0.71 – 0.85) and specificity 0.96 (95% CI: 0.96 – 0.97) (Yu et al, 2017). Further, 2012 American College of Rheumatology Guidelines recommend genotyping select Asian populations for *HLA-B*58:01* before using allopurinol given their higher risk of SCARs.

**RESEARCH QUESTION OR HYPOTHESIS:** The prevalence of *HLA-B*58:01* carrier status in Minnesota Hmong is indistinguishable from Han Chinese or Korean.

**STUDY DESIGN:** Quantitative cohort analysis.

**METHODS:** From a pharmacogenomic community-based participatory research study, *HLA-B*58:01* carrier status of US-born, Minnesota Hmong adults without a history of gout or allopurinol use was determined in a CLIA-certified laboratory using a single specific primer (SSP)-PCR. *HLA-B*58:01* carrier frequency in the Hmong cohort was compared to published frequencies reported in a Han Chinese cohort (n=2910) and in a Korean cohort (n=485) using a Chi-squared test with a Bonferroni-corrected p-value < 0.025 for significance.

**RESULTS:** Forty-nine of 70 individuals who met our inclusion criteria were genotyped for *HLA-B*58:01*. With one uninterpretable result, the prevalence of *HLA-B*58:01* **positivity in Minnesota Hmong 1/48 (2.1%) was lower than Han Chinese (19.6%, p=0.0042) but indistinguishable from Korean (12.2%, p=0.061).**

**CONCLUSION:** This is the first report on the frequency of *HLA-B*58:01* in Minnesota Hmong indicating a notable difference in HLA positivity between Hmong and Han Chinese. Though Hmong are commonly understood to be of Chinese descent, their lower prevalence underscores the risk of generalizing genotypic findings from Chinese to unique Asian populations. Until further study, current guidelines recommending prospective genotyping for *HLA-B*58:01* in the select Asian population for allopurinol use remain valid.

**367. The impact of cyp2c19 genetic mutation and non-genetic factors on the incidence of bleeding in Arab patients treated with clopidogrel in Qatar** *Zainab Ali, Bsc (Pharm)*[1], Loulia Bader, MSc (Pharmacy)[1], Dania Al-Masri, MSc (Pharmacy)[1], Mariam Ali, Bsc (Chemistry)[2], Salah Arafa, MD[2], Abdulrahman Arabi, MD[2], Shaban Mohammed, RPh, BSc Pharm (Hons), PEBCanada, BCPS[2], Nasser Rizk, MD., Ph.D..[3], Fatima Mraiche, Ph.D.[1], Moza AlHail, Bsc (Pharm),

PgDip[2], Hazem Elewa, Ph.D., RPh, BCPS[1]; [1]College of Pharmacy, Qatar University, Doha, Qatar [2]Hamad Medical Corporation, Doha, Qatar [3]Health sciences, Qatar University, Doha, Qatar

**INTRODUCTION:** Aspirin and clopidogrel are the mainstay dual antiplatelet regimen used in Qatar to treat and prevent thrombotic events in patients with acute coronary syndrome after undergoing percutaneous coronary intervention (PCI). However, this treatment may be associated with increased risk of bleeding. Some studies have shown that gain-of-function (GOF) mutation in *CYP2C19* (*CYP2C19* 17)* may result in enhanced platelet inhibition and possible increased risk of bleeding complications, although such findings were controversial.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the prevalence of *CYP2C19*17* in Arabs and what is the extent to which genetic and non-genetic factors can affect the bleeding outcomes in clopidogrel-treated patients?

**STUDY DESIGN:** This is a prospective observational cohort study.

**METHODS:** Blood samples were collected from patients that were undergoing PCI and receiving clopidogrel at a cardiology specialist tertiary hospital in Doha, Qatar. Patients were followed for 12 months via phone/medical chart (Cerner). TIMI bleeding was the primary endpoint. Genotyping was performed for *CYP2C19*17* using TaqMan assay. Binary logistic regression analysis was used to determine the factors that are associated with bleeding using SPSS.

**RESULTS:** Ninety-six patients were recruited, the majority of which were males (89.6 %) and the mean age was (56.5 $\pm$ 9.8 years). The minor allele frequency of *CYP2C19*17* was 17.7%. Eleven cases of bleeding were identified (9 minimal TIMI bleedings and 2 major TIMI bleedings). The incidence of bleeding was 37 cases/100 patient-years. Carriers of *CYP2C19* GOF allele had increased risk of bleeding vs. non-carriers (OR 45.2; 95% CI: 4.9 – 418.2, P= 0.001). The only other non-genetic factor that was associated with bleeding was stent diameter <3 mm (OR 7.10; 95% CI: 1.4 – 35.1, P = 0.016).

**CONCLUSION:** The results of this study showed that *CYP2C19* GOF variants and smaller stent diameter were associated with increased bleeding events in Arab patients taking clopidogrel.

**368. Differences in allele frequency between Hmong and east Asian population for key genetic variants within very important pharmacogenes** Ya-Feng Wen, Pharm.D.[1], Kathleen Culhane-Pera, MD, MA[2], Bharat Thyagarajan, MD, Ph.D., MPH[3], Jeffrey R. Bishop, Pharm.D., MS, BCPP[1], Heather Zierhut, Ph.D., MS[4], Muaj Lo, MD[2], Txia Xiong, BS[1], Kerui Peng, BS[1], Katherine Holzer, MS[4], Koobmeej Lee, BS[1], *Robert Straka, Pharm.D., FCCP*[1]; [1]Department of Experimental and Clinical Pharmacology, College of Pharmacy, University of Minnesota, Minneapolis, MN [2]West Side Community Health Services, St Paul, MN [3]Department of Laboratory Medicine and Pathology, School of Medicine, University of Minnesota, Minneapolis, MN [4]Department of Genetics, Cell Biology and Development, College of Biological Science, University of Minnesota, Minneapolis, MN

**INTRODUCTION:** Implementing pharmacogenomics (PGx) for *very important pharmacogenes* (VIPs) will facilitate medication selection and hold promise of improved clinical outcomes. An important aspect from the National Institutes of Health *"All of Us"* initiative is inclusion of under-served and under-studied populations. Hmong people, an ethnic group from Southeast Asia living in the US, represent an understudied population exhibiting specific health disparities. Without population specific PGx results, clinicians may inappropriately generalize from East Asian PGx data to the Hmong where allele frequencies differences may be not recognized.

**RESEARCH QUESTION OR HYPOTHESIS:** To determine allele frequencies in the Hmong for high priority VIPs and compare those frequencies with East Asian population.

**STUDY DESIGN:** Quantitative cohort study of Minnesota and Wisconsin of Hmong adults.

**METHODS:** Saliva from 182 self-identified Hmong was collected using ORAgene saliva collection kits and analyzed for 22 single nucleotide polymorphisms (SNPs) on 8 unique genes (*CYP2C19*, *CYP2C9*, *CYP4F2*, *DYPD*, *G6PD*, *SLCO1B1*, *TMPT*, *VKORC1*) using a TaqMan assay on the Biomark HD platform (Fluidigm Inc.) within a CLIA-certified laboratory. Chi-Square or Fisher's exact test (corrected *p*-value 0.002) was used to compare frequency of Clinical Pharmcogenetics Implementation Consortium (CPIC) actionable variants between our Hmong participants and an East Asian population from Genome Aggregation Database. Study was approved by University of Minnesota IRB (#1702M06041).

**RESULTS:** Statistically significant differences in allele frequencies were noted in 23% (5/22) of the CPIC actionable variants, including: 42% vs 31% in *CYP2C19*2*, 0.27% vs 6.3% in *CYP2C19*3*, 19% vs 3.4% in *CYP2C9*3*, 7% vs 25% in *CYP4F2*3*, and 4% vs 12.5% in *SLCO1B1*5* for Hmong and East Asian respectively.

**CONCLUSION:** The differences in allele frequencies for key SNPs influencing medication dosage and selection may translate into different mediation recommendations for the Hmong, relative to other East Asian populations. These differences underscore the importance of individualizing genetic information and including all communities in PGx research.

**369. Genome-wide association study accounting for medication exposure reveals a significant locus for cognitive performance in psychotic disorders** *Seenae Eum, Pharm.D.*[1], Scot K. Hill, Ph.D.[2], Ney Alliey-Rodriguez, MD[3], Leah H. Rubin, Ph.D.[4], Adam M. Lee, Ph.D.[1], Lauren J. Mills, Ph.D.[5], James L. Reilly, Ph.D.[6], Rebekka Lencer, MD[7], Sarah K. Keedy, Ph.D.[3], Elena I. Ivleva, MD[8], Rebecca Shafee, Ph.D.[9], Steven A. McCarroll, Ph.D.[9], Richard S.E. Keefe, Ph.D.[10], Godfrey D. Pearlson, MD[11], Brett A. Clementz, Ph.D.[12], Carol A. Tamminga, MD[8], Matcheri S. Keshavan, MD[13], Elliot S. Gershon, MD[14], John A. Sweeney, Ph.D.[15], Jeffrey R. Bishop, Pharm.D., MS, BCPP[16]; [1]Department of Experimental and Clinical Pharmacology, University of Minnesota, Minneapolis, MN [2]Department of Psychology, Rosalind Franklin University of Medicine and Science, North Chicago, IL [3]Department of Psychiatry and Behavioral Neurosciences, University of Chicago, Chicago, IL [4]Department of Neurology, Johns Hopkins University School of Medicine, Baltimore, MD [5]Minnesota Supercomputing Institute, University of Minnesota, Minneapolis, MN [6]Department of Psychiatry

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**INTRODUCTION:** Identifying genetic contributors to cognitive impairment in psychotic-spectrum disorders can advance understanding of disease pathophysiology. Although medication exposure may affect cognitive performance, it is often not accounted for in genetic studies.

**RESEARCH QUESTION OR HYPOTHESIS:** This is a hypothesis-free exploratory genome-wide association study (GWAS) of cognitive performance in psychotic disorders and controls.

**STUDY DESIGN:** Genome-wide analysis of subset data from the Bipolar-Schizophrenia Network on Intermediate Phenotypes (B-SNIP) study, which was a multi-site cross-sectional study.

**METHODS:** We included 817 participants (schizophrenia N=287, schizoaffective N=173, psychotic bipolar N=222, and controls N=135) from the B-SNIP study who had medication and dosing information available. Participants were 15-65 years of age and clinically stable without recent major medication changes. The Brief Assessment of Cognition in Schizophrenia (BACS) was administered to assess neurocognitive performance. Anticholinergic burden was quantified from medication regimens using the Anticholinergic Drug Scale. BACS composite scores were examined as quantitative trait phenotypes using a mixed linear model while controlling for genetic ancestry and anticholinergic burden. We performed hierarchical regression with significant polymorphisms to test the improvement in the model by adding anticholinergic information. The influence of antipsychotics and dosing was investigated by examining the effects of significant polymorphisms within subgroups of patients receiving an individual antipsychotic agent.

**RESULTS:** Compared to analyses without medication exposure, R-squared significantly increased when adding anticholinergic burden to our genetic model ($P<0.001$). Analysis adjusting for anticholinergic burden revealed BACS composite scores were significantly associated with a variant in *ITIH1* (chr3p21.1, $P=4.27\times10^{-9}$). The effect size of the top variant remained consistent when examining findings within specific antipsychotic drugs and accounting for dosing.

**CONCLUSION:** We identified a locus on chr3p21.1 robustly associated with cognitive function, which was previously reported to have associations with the risk for psychotic disorders. Including medication exposure information in GWAS analysis may improve detection of true genetic associations by reducing background variance caused by medication exposure.

**370. Characterization and comparison of gene expression of copaxone (GA-C) and Mylan's glatiramer acetate (GA-M)** Jeffrey Smith, Ph.D.[1], *Chun-Nan Hsu, Ph.D.*[2], Stephen Hull, MD[3], Peter Lipsky, MD[4]; [1]Mylan Laboratories, Morgantown, WV [2]University of California, San Diego, School of Medicine, La Jolla, CA [3]Mylan, Canonsburg, PA [4]AMPEL BioSolutions, Charlottesville, VA

**INTRODUCTION:** Glatiramer acetate (GA) is an effective treatment for patients with relapsing-remitting multiple sclerosis; GA-M provides a generic alternative to branded GA-C. As the mechanism of action (MOA) of GA is not fully understood, assessing gene expression is a potentially sensitive means to understand the MOA of a therapeutic product.

**RESEARCH QUESTION OR HYPOTHESIS:** Do immune cells activated with GA-M or GA-C produce significant differences in gene expression with respect to immune system genes?

**STUDY DESIGN:** This experimental study aims to characterize the comparative effect of GA-M and GA-C on gene expression in murine splenocytes.

**METHODS:** Splenocytes isolated from GA-C–immunized female BALB/CJ x SJL/J F1 hybrid mice were stimulated with GA-C, GA-M, or control. Total RNA was assayed using Illumina Mouse WG-6v2 microarray BeadChips. Raw data were normalized and assessed for differentially expressed genes (DEGs) using Limma (available in R package). DEGs with fold change log ratio >1 or ≤1 and a false discovery rate-adjusted (FDR-A) $P<0.05$ were assessed for molecular pathway assignment using Search Tool for the Retrieval of Interacting Genes/Proteins, Visualization and Integrated Discovery, and Ingenuity Pathway Analysis (IPA).

**RESULTS:** Gene expression levels of all DE probes confirmed that GA-M and GA-C yield highly similar global gene expression patterns: the level of correlation between gene expression in samples treated with GA-M and GA-C was high (r=0.86). A direct comparison of 7 GA-M and 9 GA-C samples did not yield any DEGs with FDR-A $P<0.01$. Comparisons between levels of individual cytokine transcripts showed no significant differences in 98% of cytokine genes analyzed. GA was found to significantly impact immune pathways by IPA canonical and gene ontology pathway analyses.

**CONCLUSION:** GA-M and GA-C induce highly similar gene expression profiles. Immune-related DEGs induced comparably by GA-M and GA-C may contribute to the therapeutic effect of GA.

**371. Functional analysis of the rad51d ovarian cancer susceptibility gene** *Morgan Ingerson, Pharm.D.. Candidate*[1], Douglas Pittman, Pharmacy Ph.D.[2]; [1]College of Pharmacy, University of South Carolina, Columbia, SC [2]Drug Discovery and Biomedical Sciences, University of South Carolina, Columbia, SC

**INTRODUCTION:** Ovarian cancer is the fifth leading cause of cancer deaths among women. High-grade serous ovarian cancer (HGSOC) is

the most common and also the most likely to benefit from a certain class of chemotherapy drugs. Because of defects in the homologous recombination (HR) pathway, HGSOC typically has a high degree of genomic instability. HR proteins include BRCA1, BRCA2, and RAD51D. Understanding the interplay between the pathway components will assist in guiding ovarian cancer treatment as well as identify new chemotherapy drug targets.

**RESEARCH QUESTION OR HYPOTHESIS:** The goal of this project is to perform lysine scanning mutagenesis of RAD51D, determine which lysines are necessary for function, and test whether they affect protein-protein interactions.

**STUDY DESIGN: Investigational** 1) RAD51D was demonstrated to undergo ubiquitination, a post-translational modification that regulates protein function. 2) Ubiquitination commonly occurs on lysine residues. Therefore, lysine scanning mutagenesis was performed and tested for cellular resistance to a DNA damaging crosslinking agent (mitomycin C). 3) Each RAD51D mutant was then tested for interaction with known interacting proteins using the yeast two hybrid system.

**METHODS:** 1) The RAD51D mutant genes were cloned into expression vectors and co-transformed into yeast with RNF138, RAD51C, or XRCC2 constructs. 2) Protein interaction was measured by both qualitative (cellular growth) and quantitative (colorimetric) assays.

**RESULTS:** Three amino acids located near the RAD51D C-terminus were shown to be necessary to confer cellular resistance to mitomycin C. The protein interaction data suggest that these three lysine to arginine substitutions do not disrupt protein interaction with RNF138, RAD51C, nor XRCC2.

**CONCLUSION:** This study has identified three critical lysine residues necessary to confer chemotherapy resistance. Because these amino acid substitutions do not appear to affect interaction with known proteins, the lysines are likely modified in order to regulate the DNA binding activity of RAD51D during homologous recombination repair.

**372. Educational benefit of personal pharmacogenomic testing in the pharmacy curriculum** *Heidi Steiner, BS*[1], Marti Larriva, Pharm.D.[1], Patrick Campbell, Pharm.D.[1], David E. Nix, Pharm.D., BCPS[1], Dee Quinn, MS[2], Walter Klimecki, DVM, Ph.D.[3], Jason Karnes, Pharm.D., Ph.D.[1]; [1]Pharmacy Practice and Science, University of Arizona College of Pharmacy, Tucson, AZ [2]University of Arizona College of Medicine, Tucson, AZ [3]Pharmacology/Toxicology, University of Arizona College of Pharmacy, Tucson, AZ

**INTRODUCTION:** Pharmacists will likely serve as a resource for interpreting pharmacogenomic (PGX) results in the future. Pharmacy students receive training in PGX, but often feel unprepared to incorporate PGX into practice. Personal genomic educational testing (PGET) may improve student knowledge, comfort, and attitudes regarding PGX. No randomized studies are available which evaluate the benefit of PGET.

**RESEARCH QUESTION OR HYPOTHESIS:** We evaluated the effect of PGET on student knowledge, comfort, and attitudes regarding PGX following a 3 credit core course in PGX.

**STUDY DESIGN:** Consenting students were randomized to receive PGX testing or no PGX testing. All students completed a pre-test and post-test survey designed to assess 1) PGX knowledge, 2) comfort with PGX patient education, 3) comfort with PGX clinical skills, and 4) attitudes toward PGX.

**METHODS:** After the pre-test survey, students randomized to PGX testing were tested using a panel for PGX variants affecting cardiovascular and neurologic drugs. Students randomized to no PGX testing were provided with the same PGX panel for a hypothetical patient. Instructors were blinded to PGX testing assignment. Following post-test surveys, paired t-tests were used to compare pre/post PGX knowledge survey responses. Wilcoxon signed rank was used to compare comfort and attitudes pre/post survey data.

**RESULTS:** A total of 53 PGX testing and 53 non-PGX testing students completed the study with no differences in baseline characteristics between groups. Among all participants, a significant improvement was observed in PGX knowledge, patient education, clinical skills, and attitudes toward PGX. Compared to non-PGX, PGX testing students demonstrated significantly higher comfort for clinical skills, including educating other healthcare professionals about PGX($p=0.01$) and communicating about drug therapy that incorporates PGX results($p=0.01$).

**CONCLUSION:** PGX knowledge and attitudes improved after core coursework. Comfort with clinical skills of PGX implementation improved with PGET. Additional studies are necessary to confirm the educational value of PGET.

**373. Associations of *abcb1* polymorphisms with adverse events stratified by HIV integrase inhibitor** Derek Murrell, BA[1], Ke-Sheng Wang, Ph.D.[2], David Cluck, Pharm.D., BCPS, AAHIVP[3], Jonathan Moorman, MD, Ph.D.[4], Michelle Duffourc, Ph.D.[5], *Sam Harirforoosh, Pharm.D., Ph.D.*[1]; [1]Department of Pharmaceutical Sciences, East Tennessee State University, Johnson City, TN [2]Department of Biostatistics and Epidemiology, East Tennessee State University, Johnson City, TN [3]Department of Pharmacy Practice, East Tennessee State University, Johnson City, TN [4]Department of Internal Medicine, East Tennessee State University, Johnson City, TN [5]Department of Biomedical Sciences, East Tennessee State University, Johnson City, TN

**INTRODUCTION:** As interest in precision medicine rises, several drug classes have been examined including HIV antiretrovirals. HIV integrase inhibitors (IN) are commonly prescribed and efficacious; however, variability in adverse event (AE) profiles may limit usage. Thus, pharmacogenetic evaluation of INs may help explain AE occurrence.

**RESEARCH QUESTION OR HYPOTHESIS:** In this exploratory cohort of subjects receiving INs, we investigated the relationship between selected single nucleotide polymorphisms (SNPs) in the ABCB1 (p-glycoprotein) gene and central nervous system AEs.

**STUDY DESIGN:** Single center, exploratory, observational study.

**METHODS:** Eighty-eight HIV positive adults were differentiated by integrase inhibitor (regardless of backbone regimen), dolutegravir (n=42, 88.1% male), elvitegravir (n=23, 87.0% male), or raltegravir (n=23, 82.6% male). Binary data was collected for AE occurrence in the preceding two weeks as well as individual genotypes of three

*ABCB1* SNPs (rs1045642, rs1128503, and rs3213619). Logistic regression, with and without covariates (age, BMI, sex, and regimen duration), was conducted with PLINK 1.07 to determine associations. Statistical significance was conferred at $p<0.05$.

**RESULTS:** One association of fatigue with rs1045642 ($p=0.008$), without covariates, was found in the dolutegravir group. The only association found in the elvitegravir group was between rs1128503 and an absence of AEs prior to covariate adjustment. Finally, abnormal dreams and rs1128503 showed an association ($p=0.049$) when adjusted for covariates in raltegravir-based regimens. All other comparisons were not statistically significant.

**CONCLUSION:** These results indicate that pharmacogenetics may play a role in predicting the AE profile of IN-based regimens specifically fatigue and abnormal dreams in dolutegravir and raltegravir, respectively. As the identification of patient outcome determinants contributes to better utilization of medication, especially in first line therapies such as IN, these exploratory findings provide support for further examination of precision medicine in HIV pharmacotherapy.

**374. Warfarin pharmacogenomis in a hispanic population: a candidate snp study** *Justin Kaye, BA, PSM*[1], Heidi Steiner, BS[1], Jared Wahl, BS, MPH[2], Nancy Sweitzer, MD, Ph.D.[3], Jason Karnes, Pharm.D., Ph.D.[1]; [1]Pharmacy Practice and Science, University of Arizona College of Pharmacy, Tucson, AZ [2]Pharmacy Practice and Science, Tucson, AZ [3]Sarver Heart Center, Tucson, AZ

**INTRODUCTION:** Warfarin remains one of the most widely prescribed anticoagulants but is a leading cause of adverse drug reactions. Genotype-guided warfarin dosing algorithms enable accurate dose estimation, potentially leading to improved safety and efficacy. However, genotype-guided dosing algorithms were developed primarily in populations of European descent and limited data are available regarding single nucleotide polymorphisms (SNPs) that significantly influence warfarin dose in Hispanic populations.

**RESEARCH QUESTION OR HYPOTHESIS:** We examined whether clinical factors and SNPs previously shown to influence warfarin stable dose in populations of European and Hispanic descent accurately predicted warfarin stable dose in a Hispanic population.

**STUDY DESIGN:** Self-reported Hispanic and Latino patients on stable warfarin dose (defined as the same dose for at least two clinic visits separated by at least two weeks) were recruited.

**METHODS:** Candidate SNPs, including *CYP2C9**2/*3, *VKORC1*-1639G>A, *CYP4F2**3, and *NQO1**2, were genotyped and clinical data were collected using a survey and the electronic medical record. Stepwise linear regression was performed to determine variables that significantly predicted square root of weekly warfarin dose.

**RESULTS:** A total of 76 patients of primarily Mexican American ancestry participated. All SNPs were within Hardy-Weinberg Equilibrium. The final stepwise regression model incorporated six variables, which explained 71% of the variability in warfarin weekly dose requirements. Significant predictors included weight ($R^2=0.287$, $p<0.0001$), age ($R^2=0.143$, $p<0.0001$), amiodarone use ($R^2=0.067$, $p=0.0005$), and prior stroke ($R^2=0.025$, $p=0.02$). Significant SNPs included *VKORC1*-1639A ($R^2=0.152$, $p<0.0001$), and *CYP2C9**2/*3 ($R^2=0.032$, $p=0.02$). *CYP4F2*3* and *NQO1**2 did not significantly impact warfarin dose requirements despite previously published associations in Hispanic populations.

**CONCLUSION:** These findings suggest that clinical and genetic predictors of warfarin weekly dose requirements are similar among populations of European descent and Hispanic populations with Mexican American ancestry. These results require replication and validation in independent cohorts with similar ethnicity, but advance our understanding of influences on warfarin dose variability among different race/ethnic groups.

**375. Pharmacist-driven implementation of cyp2c19 genotyping to guide voriconazole prophylaxis in neutropenic cancer patients** Rod Quilitz, Pharm.D.[1], Wonhee So, Pharm.D.[1], Yanina Pasikhova, Pharm.D.[2], Rebecca Nelson, Pharm.D.[1], Kerry Kelly, MS[1], Ana Velez, MD[1], John Greene, MD[1], Howard McLeod, Pharm.D.[1], *Kevin Hicks, Pharm.D., Ph.D.*[3]; [1]Moffitt Cancer Center, Tampa, FL [2]Department of Pharmacy, H. Lee Moffitt Cancer Center and Research Institute, Tampa, FL [3]DeBartolo Family Personalized Medicine Institute, Moffitt Cancer Center, Tampa, FL

**INTRODUCTION:** Invasive fungal infections are a major contributor to morbidity and mortality in neutropenic cancer patients. Voriconazole, an effective antifungal prophylactic, is metabolized by the polymorphic CYP2C19 enzyme. Approximately 25% of individuals carry a *CYP2C19* genetic variant that is predictive of rapid metabolism and are at risk of sub-therapeutic voriconazole concentrations.

**RESEARCH QUESTION OR HYPOTHESIS:** Increasing the voriconazole dose for CYP2C19 rapid metabolizers will result in a higher percentage of patients attaining therapeutic concentrations.

**STUDY DESIGN:** We implemented a quality improvement pilot utilizing *CYP2C19* genotype to optimize voriconazole prophylactic dosing in adult neutropenic cancer patients.

**METHODS:** The Luminex xTAG CYP2C19 Kit v3 is utilized for *CYP2C19* genotyping. *CYP2C19*-guided recommendations are as follows: avoidance of voriconazole in ultrarapid metabolizers, voriconazole 300 mg twice daily (BID) for rapid metabolizers, and voriconazole 200 mg BID for all other phenotypes. Clinical decision support, including interruptive alerts and automated antimicrobial stewardship consultations, was deployed to the EHR. Therapeutic drug monitoring is performed at the discretion of the medical team (goal trough concentration of 1-5.5 mcg/ml).

**RESULTS:** To date, 341 patients have undergone *CYP2C19* genotyping; 6 (1.8%) ultrarapid, 95 (27.9%) rapid, 139 (40.8%) normal, 94 (27.5%) intermediate, and 7 (2.1%) poor metabolizers were observed. Of those receiving prophylactic voriconazole, 87.2% were dosed per *CYP2C19*-guided recommendations. Pre-intervention (voriconazole 200 mg BID) and post-intervention (voriconazole 300 mg BID) voriconazole trough concentrations were compared. Only 50% of CYP2C19 rapid metabolizers receiving voriconazole 200 mg BID achieved the goal trough concentration, whereas 75% of rapid metabolizers receiving voriconazole 300 mg BID achieved the goal trough concentration.

**CONCLUSION:** Pharmacist-driven implementation of *CYP2C19* genotyping to guide voriconazole prophylactic dosing is feasible. Increasing the voriconazole dose to 300 mg BID for CYP2C19 rapid metabolizers resulted in 75% of patients achieving the goal trough concentration. Future analysis will determine if *CYP2C19*-guided voriconazole dosing prevents breakthrough fungal infections.

**376. Pharmacogenetic analysis of the gastrointestinal adverse effect profiles in HIV integrase inhibitor-based regimens** Derek Murrell, BA[1], Ke-Sheng Wang, Ph.D.[2], *David Cluck, Pharm.D., BCPS, AAHIVP*[3], Jonathan Moorman, MD, Ph.D.[4], Michelle Duffourc, Ph.D.[5], Sam Harirforoosh, Pharm.D., Ph.D.[1]; [1]Department of Pharmaceutical Sciences, East Tennessee State University, Johnson City, TN [2]Department of Biostatistics and Epidemiology, East Tennessee State University, Johnson City, TN [3]Department of Pharmacy Practice, East Tennessee State University, Johnson City, TN [4]Department of Internal Medicine, East Tennessee State University, Johnson City, TN [5]Department of Biomedical Sciences, East Tennessee State University, Johnson City, TN

**INTRODUCTION:** HIV integrase inhibitors are currently utilized as efficacious frontline therapies. However, in addition to the goal of virological suppression, adverse event profiles, which may vary among subjects, often play an important role in the selection and maintenance of an HIV antiretroviral therapy.

**RESEARCH QUESTION OR HYPOTHESIS:** We sought to identify associations between gastrointestinal (GI) adverse events and single nucleotide polymorphisms (SNPs) in an exploratory cohort of patients receiving integrase inhibitor-based regimens.

**STUDY DESIGN:** An observational study of an exploratory nature at a single center.

**METHODS:** Adult patients infected with HIV-1 currently maintained on an integrase inhibitor were recruited. The cohort was comprised of 42 dolutegravir subjects (11.9% female), 23 elvitegravir subjects (13.0% female), and 23 raltegravir subjects (17.4% female). The absence or occurrence of GI adverse events (nausea, vomiting, and diarrhea) over the previous 14 days was recorded via questionnaire. Using a blood sample collected from each subject, several SNPs on the iPLEX ADME PGx Panel v1.0 were genotyped. Logistic regression with an additive model via Plink 1.07 was utilized to determine pharmacogenetic associations. A *p*-value less than 0.05 was considered significant.

**RESULTS:** One association ($p$=0.045) was found between nausea and rs2070673 in the CYP2E1 gene, within the dolutegravir group. The dolutegravir group also presented an association ($p$=0.020) of vomiting with rs2069514 (*CYP1A2*). Finally, diarrhea was associated with an *ABCC2* SNP, rs2273697 ($p$=0.047), in the dolutegravir group and rs12248560 ($p$=0.023), within *CYP2C19*, in the elvitegravir group. No other statistically significant GI-SNP associations were detected.

**CONCLUSION:** Our results suggest that subject genetic makeup may influence regimen tolerability specifically concerning dolutegravir and elvitegravir. Due to the exploratory nature of this study, further studies are needed to determine SNP contributions to the likelihood of adverse events.

**377E. ABCB1 polymorphisms and warfarin treatment in patients with mechanical cardiac valve** *Sook Hee An, Ph. D.*[1], Kyung Eun Lee Lee, Ph. D., Pharm D.[2], Byung Chul Chang, Ph.D., MD[3], Hyesun Gwak, Ph.D., Pharm.D.[4]; [1]College of pharmacy, Wonkwang University, Iksan, Korea, Republic of (South) [2]College of Pharmacy, Chungbuk National University, Osong, Korea, Republic of (South) [3]Department of Thoracic & Cardiovascular Surgery, Yonsei University Medical Center, Seoul, Korea, Republic of (South) [4]College of Pharmacy & Division of Life and Pharmaceutical Sciences, Ewha Womans University, Seoul, Korea, Republic of (South)

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## PHARMACOKINETICS/ PHARMACODYNAMICS/DRUG METABOLISM/DRUG DELIVERY

**378. Influence of creatinine clearance estimation method on extended-interval aminoglycoside (ags: gentamicin or tobramycin) dosing for obese adult patients** *Larry Bauer, Pharm.D.*; Department of Pharmacy, University of Washington, Seattle, WA

**INTRODUCTION:** Two methods to estimate creatinine clearance (eCrCl) for obese adult patients predominate for computation of initial doses of AGS.

**RESEARCH QUESTION OR HYPOTHESIS:** Compare initial doses computed using 2 different eCrCl methods {(1) Salazar-Corcoran: S-C; (2) modified Cockcroft-Gault using adjusted body weight (ABW = IBW+0.4[TBW-IBW]): modC-G}; initial doses versus final, adjusted doses to attain target Css; and initial Css from computed doses with final Css.

**STUDY DESIGN:** Observational, 121 patients (61M/60F); criterion: obese (>30% over IBW) adult patients, susceptible infections, steady-state antibiotic plus stable Scr concentrations.

**METHODS:** Initial doses computed using standard pharmacokinetic equations (*Applied Clinical Pharmacokinetics, 3/e*) with either S-C or modC-G used to compute eCrCl. Final, adjusted doses computed to attain individualized goal between 15-30 mg/L peak/< 1 mg/L trough. Initial versus final, adjusted doses and estimated versus final, adjusted Css compared for precision and bias using the Sheiner and Beal method (*J Pharmacokinet Biopharm*. 1981 Aug;9(4):503-12).

**RESULTS:** Patient age: 24-79 years, percent over IBW: 32-126%, Scr: 0.4-3.9 mg/dL. Initial doses computed using modC-G were significantly smaller (-19%, $p<0.05$, ANOVA) than those computed using S-C (+4%, NS) compared to the final, adjusted doses. Estimated Css using modC-G were significantly less (-22% peak/-25% trough, $p<0.05$) than those estimated using S-C (+4% peak/+7% trough, NS) compared to final, adjusted Css. Doses and Css predicted using modC-G were less precise and biased compared to those computed using S-C. Initial doses were adjusted to attain target Css for 71% of patients when modC-G was used versus 32% of patients when S-C was used.

**CONCLUSION:** Using S-C for eCrCl to dose AGS for obese adult patients is more precise and less biased than using modC-G. This is most likely due to modC-G computing eCrCl values that are ~15-25% less than S-C for most patients. A smaller number of patients require subsequent dosage adjustments when using S-C.

**379. Evaluation of vancomycin dosing strategies to achieve target trough concentrations in the obese population** *Kisha Dunkley, Pharm. D., BCPS*[1], Amanda Sowell, Pharm.D., BCPS[2], Kathryn Dzintars, Pharm. D., BCPS[1], Virna Almuete, Pharm.D. BCOP[1], Maggie Chan, Pharm.D., BCPS[1], Jackie Tran, Pharm.D., BCPS[3], Leigh Efird, Pharm.D., MPH, BCPS[4]; [1]The Johns Hopkins Hospital, Baltimore, MD [2]Palmetto Health Richland, Columbia, SC [3]Johns Hopkins Medicine, Baltimore, MD [4]New York Presbyterian Hospital, New York, NY

**INTRODUCTION:** Optimal dosing of vancomycin in the obese population is unknown but of value given the obesity epidemic.

**RESEARCH QUESTION OR HYPOTHESIS:** Is there a difference in target trough attainment in obese patients who received standard dose (15-20 mg/kg) versus reduced dose (10-14.9 mg/kg) of vancomycin? Is there a difference in the average mg/kg dosing, supratherapeutic rate and target trough attainment in two sub-populations: 1) obese versus morbidly obese and 2) males versus females?

**STUDY DESIGN:** Retrospective cohort study in obese adults receiving vancomycin from January 1, 2014 to June 30, 2015.

**METHODS:** Obese patients (≥100 kg and BMI ≥ 30 kg/m$^2$) who received at least four consecutive doses of intravenous vancomycin and had an appropriately drawn trough concentration were included. Therapeutic serum vancomycin trough were defined as 10-20 µg/mL.

**RESULTS:** 286 obese patients had an average dose of 13.3 mg/kg, commonly dosed every 12 hours. Proportion of therapeutic trough attainment between reduced and standard dosing was 63% vs 49%, *P=0.07*. Patients on reduced dosing had lower troughs (16.5±7.3 vs 20.2±7.8 µg/mL, *P=0.003*), and less supratherapeutic troughs (22% vs 43%, *P=0.004*). Morbidly obese patients received lower doses than obese (12.6±2.3 mg/kg vs 13.7±2.0 mg/kg, *P<0.001*), had higher troughs (18.9±7.2 µg/mL vs 15.7±7.3 µg/mL, *P <0.001*) and greater rate of supratherapeutic troughs (36% vs 23%, *P = 0.01*). Females with similar average dose as males had higher troughs (18.7±7.7 vs 15.3±6.9 µg/mL, *P<0.001*) and more supratherapeutic troughs (33% vs 20%, *P=0.01*). No difference was found in the attainment of therapeutic trough between obese versus morbidly obese (60% vs 55%, *P=0.39*), and females versus males (62% vs 60%, *P=0.81*).

**CONCLUSION:** Our study demonstrated reduced vancomycin dosing may provide safety while maintaining comparable efficacy to standard vancomycin dosing strategies in obese patients. The degree of obesity and gender may be important factors to consider when dosing vancomycin.

**380. Pharmacokinetics (pk) of bictegravir (bic) in combination with polyvalent cation containing (pvcc) antacids and supplements** Anita Mathias, Ph.D., Steve West, MSPH, Deqing Xiao, Ph.D., *Elena Chan, Pharm.D.*, Susan Chuck, Pharm.D., Hal Martin, MD, MPH, Erin Quirk, MD, Brian Kearney, Pharm.D.; Gilead Sciences, Foster City, CA

**INTRODUCTION:** BIC is a potent, unboosted integrase strand transfer inhibitor (INSTI) in the HIV single-tablet regimen BIC/emtricitabine/tenofovir alafenamide (B/F/TAF). BIC has a high mean inhibitory quotient (IQ) of 16 and a wide therapeutic window. Like other INSTIs, BIC is susceptible to chelation-type drug interactions resulting in decreased BIC exposure.

**RESEARCH QUESTION OR HYPOTHESIS:** Can B/F/TAF and PVCC antacids/supplements be coadministered without altering BIC efficacy?

**STUDY DESIGN:** Evaluation of BIC PK with PVCC antacids and supplements in 42 healthy subjects.

**METHODS:** B/F/TAF was coadministered simultaneously under fasted and fed conditions with maximum strength antacid (aluminum hydroxide 1600mg, magnesium hydroxide 1600mg, simethicone 160mg), calcium carbonate (1200mg), or ferrous-fumarate (324mg). Staggering B/F/TAF ±2 hours from antacid under fasted conditions was evaluated. BIC exposures were compared to B/F/TAF administered alone fasted and geometric least-squares mean (GLSM) ratios were calculated.

**RESULTS:** B/F/TAF coadministered simultaneously with cations under fasted conditions reduced BIC exposures. Under fed conditions, BIC exposures were reduced only with antacid and remained unaffected by calcium carbonate or ferrous fumarate supplements. When B/F/TAF was administered in the fasted state 2 hours after antacid, BIC exposures were reduced 52% but projected to be above $EC_{50}$ concentrations (IQ~8). BIC exposures were not affected by B/F/TAF administered fasted 2 hours before antacid. All study treatments were well tolerated.

| B/F/TAF Dosing | Diet | Cation | BIC AUC GLSM Ratio (90% CI) | % Mean Change |
|---|---|---|---|---|
| **Simultaneous** | Fasted | Antacid | 0.21(0.18-0.26) | -79% |
| | | Iron supplement | 0.37(0.33-0.42) | -63% |
| | | Calcium Supplement | 0.67(0.57-0.78) | -33% |
| **Simultaneous** | Fed | Antacid | 0.53(0.44-0.64) | -47% |
| | | Iron Supplement | 0.84(0.74-0.95) | -16% |
| | | Calcium Supplement | 1.03(0.89-1.20) | +3% |
| **2hr Before** | Fasted | Antacid | 0.87(0.81-0.93) | -13% |
| **2hr After** | | | 0.48(0.38-0.59) | -52% |

**CONCLUSION:** Under dosing conditions tested, administering B/F/TAF and PVCC antacids/supplements 1) simultaneously with food or 2) fasted with a 2-hour stagger provided BIC exposures that were within the B/F/TAF Phase 3 registrational trials' range of values associated with efficacy.

**381. Development of nat2-genotype-based limited sampling strategies toward isoniazid therapeutic drug monitoring in korean patients**

**with tuberculosis** *Giwon Choi, Pharm.D.*[1], Eun Kyoung Chung, Pharm. D., Ph.D., BCPS[2], Su Young Jung, Bachelor[1], Suhyun Lee, Bachelor[1], Eun Sun Kim, MD[3], Jong Sun Park, MD[3], Junghan Song, MD[4], Jaeho Lee, MD[3], Jangik Lee, Pharm.D. Ph.D.[1]; [1]Department of Pharmacy, College of Pharmacy, Seoul National University, Seoul, Korea, Republic of (South) [2]Department of Pharmacy, College of Pharmacy, Kyung Hee University, Seoul, Korea, Republic of (South) [3]Division of Pulmonary and Critical Care Medicine, Department of Internal Medicine, Seoul National University College of Medicine, Seoul National University Hospital, Gyeonggi-do, Korea, Republic of (South) [4]Department of Laboratory Medicine, Seoul National University College of Medicine, Seoul National University Hospital, Gyeonggi-do, Korea, Republic of (South)

**INTRODUCTION:** Clinical outcomes of isoniazid are best predicted by the area under the concentration-time curve over 24 hours ($AUC_{24}$). Although little evidence is available to support its correlation with isoniazid $AUC_{24}$, plasma isoniazid concentrations at two hours post dose ($C_2$) are frequently used for therapeutic drug monitoring (TDM).

**RESEARCH QUESTION OR HYPOTHESIS:** Is $C_2$ an optimal time points for isoniazid blood sampling for estimation of $AUC_{24}$ considering NAT2 genotype?

**STUDY DESIGN:** A prospective, single-center study was conducted in Korean tuberculosis patients receiving isoniazid 300 mg once daily.

**METHODS:** Isoniazid plasma concentrations were measured by liquid chromatography with mass spectrometry. NAT2 genotypes were determined by a mini-sequencing (SNaPshot) method. Pharmacokinetic parameters estimated using a non-compartmental method (WinNonlin v8.0) were compared between slow and non-slow acetylators. Linear regression analyses (SAS v9.4) were performed to evaluate the relationship between the isoniazid plasma concentrations at different time points and $AUC_{24}$ in the two groups separately. Statistical significance was defined by $p<0.05$.

**RESULTS:** A total of 21 patients were enrolled in the study. Isoniazid $AUC_{24}$, CL/F, and $t_{1/2}$ were different between slow (n=10) and non-slow (n=11) acetylators (29.8±14.4 vs. 9.87±6.75 mcg*h/mL, p=0.001; 14.1±10.7 vs. 43.3±27.4 L/h, p=0.001; 3.4±0.8 vs. 2.4±1.2 h, p=0.049, respectively). In the regression analyses, $C_4$ was the concentration-time point that most accurately estimated the $AUC_{24}$ for both groups; the coefficients of determination (adjusted $r^2$) between $C_4$ and $AUC_{24}$ were 0.90 ($p<0.001$) and 0.94 ($p<0.001$) in slow and non-slow acetylators, respectively. In contrast, the relationship between $C_2$ and $AUC_{24}$ was weak in slow ($r^2=0.55$, p=0.009) and fair in non-slow acetylators ($r^2=0.84$, $p<0.001$).

**CONCLUSION:** $C_4$ estimates the isoniazid $AUC_{24}$ most accurately and reliably regardless of NAT2 genotypes. Therefore, monitoring C4, rather than C2, should be considered for the purpose of isoniazid TDM in tuberculosis patients.

**382. Comparative pharmacokinetic evaluation of enalapril administered using a reference and the developed child appropriate dosage formulation** *Muhammad Faisal, Pharm D, M/Phil*[1], Willi Cawello, Ph.D[1], Stephanie Laer, MD Ph.D.[1]; [1]Institute of Clinical Pharmacy and Pharmacotherapy, Heinrich Heine University, Duesseldorf, Duesseldorf, Germany

**INTRODUCTION:** Comparative pharmacokinetic (PK) data analysis of drugs administered using developed child-appropriate and market authorized dosage formulation is sparse and is important in pediatric drug development.

**QUESTION:** To evaluate PK differences of Enalapril administered as treatment A (reference Renitec tablets administered with 240 ml water), treatment B (child-appropriate oral dispersible mini-tablets (ODMT) with 240 ml water) and treatment C (Child appropriate ODMTs with 20 ml water) by using PK compartment model (CM) and validated least-square-minimization-method (LSMM) of parameter estimation.

**STUDY DESIGN:** A 3-period, phase 1 clinical trial was conducted where 3 treatments of Enalapril i.e. reference treatment A, treatment-B, and treatment-C was administered to 24 healthy adult volunteers.

**METHODS:** Phoenix WinNonlin software incorporated one-compartment model (CM) adequately predicted serum enalapril concentrations except for fewer lower concentrations at second incomplete terminal elimination phase. Although two-CM predicted those lower concentrations, but resulted in over parametrization and was rejected. For parameter estimation, ordinary, weighted and iteratively reweighted least-square-minimization-methods (LSMM) were compared in simulated validation analysis. Iteratively reweighted LSMM was selected to iterate most accurate and precise one-CM PK parameters, which includes rate constants of absorption (Ka), and elimination (Ke), relative bioavailability (Vd/f) and delay of drug appearance in serum (tlag). Iterated one-CM PK parameters were log transformed and statistically correlated by performing two-sided paired t-test. P-value less than 0.05 was considered statistically significant.

**RESULTS:** Comparison of PK parameters showed significant difference (p=0.018) in early appearance of drug (tlag) in serum from treatment-B compared to treatment-A. No other difference in PK of all three treatments was observed.

**CONCLUSION:** Compared to reference treatment-A, child-appropriate ODMT administered with 240ml water absorbed and appeared earlier in plasma. No other difference in absorption (Ka), elimination (Ke) and relative bioavailability (Vd/f) of drug between the two treatments were observed. No difference in onset and rate of absorption between orally dispersed and retained treatment-C versus treatment-B may show absence or minute trans-mucosal absorption.

**383E. Characterizing variability in calculated vancomycin pharmacokinetic parameters using an AUC-based dosing strategy in hospitalized patients** Ana Vega, Pharm.D.[1], Christine Nguyen, Pharm.D.[1], Kimberly Claeys, Pharm.D., BCPS[2], *Emily Heil, Pharm.D., BCPS AQ ID*[2]; [1]Department of Pharmacy Practice and Science, University of Maryland School of Pharmacy, Baltimore, MD [2]University of Maryland School of Pharmacy, Baltimore, MD

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**384. Pharmacokinetics of vancomycin in critically ill patients undergoing sustained low efficiency dialysis (sled) therapy** *Taylor Rider, Pharm.D., BCPS*[1], Kevin Silinskie, Pharm.D.[1], Mindee Hite, Pharm.D.[1], Jonathon Bress, MD[2]; [1]Department of Pharmacy, Rochester General Hospital, Rochester, NY [2]Nephrology Department, Rochester General Hospital, Rochester, NY

**INTRODUCTION:** Vancomycin pharmacokinetic (PK) data in critically ill patients receiving SLED is limited. Published data utilizing vancomycin and alternative dialysis methods (intermittent dialysis and continuous renal replacement therapy) may not be applicable due to SLED being a hybrid dialysis modality. Current drug references lack recommendations for vancomycin dosing in patients receiving SLED.

**RESEARCH QUESTION OR HYPOTHESIS:** The purpose of this study is to define vancomycin elimination on SLED and amount of vancomycin rebound four hours post-SLED. Vancomycin volume of distribution (Vd) and area-under-the-curve (AUC) were also assessed as secondary outcomes.

**STUDY DESIGN:** Prospective, single center PK study in critically ill patients.

**METHODS:** Twenty critically ill patients with oliguric or anuric renal failure who concomitantly received vancomycin and SLED therapy were included. Surrounding one SLED treatment, serum vancomycin blood samples were drawn prior to the initiation of SLED, at the termination of SLED and four hours after the completion of the SLED treatment. Patients then received a vancomycin dose, in which a peak level was drawn one hour after the end of the infusion. SLED treatment duration was at least seven hours. Continuous data are reported as median [IQR] and categorical data as percentage.

**RESULTS:** The vancomycin elimination rate and half-life were 0.051 hour$^{-}$ [0.042-0.074] and 13.6 hours [9.4-16.6], respectively. SLED reduced the vancomycin serum concentration by 35.4% [31.5-43.8] and vancomycin rebound was 9.8% [2.5-13.7]. The vancomycin dose administered post-SLED was 1,000 mg [875-1125]. For eighteen patients, the Vd was 0.88 L/kg [0.67-1.1], clearance was 3.5 L/hr [2.2-5.2] and the AUC was 276 mcg ·hr/mL [244-296].

**CONCLUSION:** Vancomycin is significantly removed with little rebound four hours after SLED treatment. Based on our findings, critically ill patients receiving SLED may require 1,000 mg after each SLED treatment to maintain post-SLED vancomycin serum concentrations between 10-20 mcg/mL. Therapeutic drug monitoring is recommended.

**385. Persistence rates of oral anticoagulants for non-valvular atrial fibrillation in obese patients** Rashmi Patel, Pharm.D., BCPS[1], *Rachel Flurie, Pharm.D., BCPS*[1], Nancy S. Yunker, Pharm.D., FCCP, BCPS[2], Brian S. Di Pace, MPH[3]; [1]Virginia Commonwealth University Health Pharmacy Department, Virginia Commonwealth University, Richmond, VA [2]Virginia Commonwealth University School of Pharmacy, Richmond, VA [3]Virginia Commonwealth University Department of Biostatistics, Virginia Commonwealth University Department of Biostatistics, Richmond, VA

**INTRODUCTION:** Direct oral anticoagulants (DOACs) are an alternative to warfarin for stroke prevention in patients with non-valvular atrial fibrillation (NVAF). They have more predictable pharmacokinetics and require less frequent monitoring than warfarin, but it is unclear what effect that may have on medication persistence. No study has specifically evaluated any differences in persistence in obese patients.

**RESEARCH QUESTION OR HYPOTHESIS:** The purpose of this quality improvement project is to compare the persistence rates of obese patients with NVAF prescribed a DOAC versus warfarin.

**STUDY DESIGN:** This single center, retrospective chart review included patients 18 and older, newly diagnosed NVAF, obese (BMI ≥30kg/m$^2$ or actual body weight ≥100kg), and prescribed warfarin, apixaban, rivaroxaban, or dabigatran. Patients were excluded if they did not have at least an initial fill history of 60 days, were pregnant, had cancer, were prisoners, had valvular disease, or had a reversible cause of AF.

**METHODS:** The primary objective was to assess the 3, 6, 9, and 12-month persistence rates of patients prescribed warfarin versus those prescribed a DOAC. Non-persistence was defined as the presence of a ≥60 day gap in medication fill history. Secondary outcomes included incidence of stroke, major bleeding, mortality, hospitalizations, and switches in oral anticoagulants.

**RESULTS:** Seventy-two patients were included with an average BMI of 36.9kg/m$^2$. Results found persistence rates ranging between 80-100% at 3 (p >0.99), 6 (p >0.99), 9, and 12 months in both groups; there was no difference found between groups. At 12 months, 84.7% of patients had no refill data possibly because their indication for anticoagulation resolved, they experienced medication side effects, or they were lost to follow up.

**CONCLUSION:** No difference was found for incidences of stroke, bleeding or mortality between groups. This study showed strong persistence rates for obese patients taking warfarin or a DOAC and high medication discontinuation rates.

**386. Extended stability of isoproterenol hydrochloride injection in polyvinyl chloride bags stored in amber ultraviolet light blocking bags** *Edward T. Van Matre, Pharm.D., MS*[1], Clark Lyda, Pharm.D.[2], Michael Larkin, Pharm.D.[2], Tabetha Mcalwee, Pharm.D.[2], Tyree Kiser, Pharm.D.[3]; [1]University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO [2]University of Colorado Hospital, Aurora, CO [3]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

**INTRODUCTION:** Isoproterenol hydrochloride (HCL) is an injectable catecholamine with potent $\beta_1$and $\beta_2$ properties utilized primarily for acute bradyarrhythmias. No stability-indicating studies have evaluated the stability of isoproterenol HCL in polyvinyl chloride bags for greater than 10 days.

**RESEARCH QUESTION OR HYPOTHESIS:** The purpose of this study was to determine the physical and chemical stability of isoproterenol HCL at concentrations of 4 μg/mL in 0.9% sodium chloride when stored at room temperature or refrigerated for 90 days while in amber ultraviolet light blocking bags.

**STUDY DESIGN:** Ninety-day drug stability study

**METHODS:** Dilutions of isoproterenol HCL to concentrations of 4 µg/mL was performed under aseptic conditions. The bags were then placed into ultraviolet light blocking bags and stored at room temperature (23-25 °C) or under refrigeration (3-5 °C). Three samples of each preparation and storage environment were analyzed on days 0, 30, 45, 60, and 90. Physical stability was performed by visual examination. The pH was assessed at baseline and upon final degradation evaluation. Sterility of the samples was not assessed. Chemical stability of isoproterenol HCL was evaluated using tandem mass spectrometry. To determine the stability-indicating nature of the assay, forced degradation was evaluated. Samples were considered stable if there was less than 10% degradation of the initial concentration.

**RESULTS:** Isoproterenol HCL diluted to 4 µg/mL with 0.9% sodium chloride injection and stored in amber ultraviolet light blocking bags was physically stable throughout the study. No precipitation was observed. At days 30, 45, 60, and 90 all bags had less than 10% degradation at room temperature and under refrigeration.

**CONCLUSION:** Isoproterenol HCL diluted to 4 µg/mL with 0.9% sodium chloride injection was stable up to 90 days at room temperature and under refrigeration.

**387. Demonstration of equivalence of Mylan's generic glatiramer acetate (MGA) to copaxone (cop)** Peter Lipsky, MD[1], Patrick T. Vallano, Ph.D.[2], Jeffrey Smith, Ph.D.[2], Walter Owens, Ph.D.[2], Daniel Snider, Ph.D.[2], Viswanath Bandaru, Ph.D.[2], Yunfu Sun, Ph.D.[2], Ross Wallingford, Ph.D.[2], Stephen Hull, MD[3], Joseph Duncan, Ph.D.[2], Joshua H. Lewis, BS[2], Jason Southall, Ph.D.[2], *Azeem Ansari*, *Ph.D.*[2], Hong Li, Ph.D.[2]; [1]AMPEL BioSolutions, Charlottesville, VA [2]Mylan Laboratories, Morgantown, WV [3]Mylan, Canonsburg, PA

**INTRODUCTION:** COP or glatiramer acetate (GA) is an established first-line treatment for patients with relapsing-remitting multiple sclerosis (RRMS). A generic GA, MGA, was approved by the US Food and Drug Administration (FDA) in 2017.

**RESEARCH QUESTION OR HYPOTHESIS:** Is MGA a therapeutically equivalent substitute for COP?

**STUDY DESIGN:** To demonstrate equivalence of MGA to COP by using the 4 criteria for active pharmaceutical ingredient (API) sameness previously established by the FDA.

**METHODS:** The synthetic process scheme of MGA was compared with published reaction schemes for COP and patents describing its synthesis. Comparative physiochemical property analyses included amino acid composition, molecular weight distribution, spectroscopic fingerprints, total diethylamine (DEA) content, relative proportions of DEA-adducted amino acids, and terminal amino acid sequences. Biological activity of the products was assessed using 3 experimental autoimmune encephalomyelitis (EAE) mouse models that were scored for EAE clinical signs daily.

**RESULTS:** MGA is produced using the same fundamental reaction scheme as COP and was shown to have equivalent physicochemical properties. Amino acid composition, molecular weight distribution, polydispersity index, and spectral fingerprints of MGA were found to be equivalent to COP. Analyses of structural signatures demonstrated equivalence of MGA and COP with regard to polymerization and depolymerization; DEA content and mole fractions of all DEA-adducted amino acids in MGA were equivalent to COP. N-terminal and C-terminal amino acid compositions of MGA and COP met equivalent criteria. In all EAE models, MGA and COP comparably reduced disease severity relative to control, providing confirmatory evidence of sameness in a validated, in vivo MS model.

**CONCLUSION:** A rigorous, multi-pronged comparison of MGA and COP demonstrated equivalent physiochemical properties, structural signatures for polymerization and depolymerization, and equivalent biological activity as evidenced by comparable effects in EAE. Collectively, these data demonstrate that MGA meets the FDA criteria for API sameness.

**388. Characterization of vancomycin pharmacokinetics and pharmacodynamics in obese septic shock patients** *Anne Masich*, *Pharm.D.*[1], Shamir Kalaria, Pharm.D.[2], Jeffrey Gonzales, Pharm.D., BCPS, FCCM[2], Emily Heil, Pharm.D., BCPS AQ ID[2], Asha Tata, Pharm.D., BCPS[3], Kimberly Claeys, Pharm.D., BCPS[2], Devang Patel, MD[4], Mathangi Gopalakrishnan, MS, Ph.D.[2]; [1]Virginia Commonwealth University Health System, Richmond, VA [2]University of Maryland School of Pharmacy, Baltimore, MD [3]University of Maryland Medical Center, Baltimore, MD [4]University of Maryland School of Medicine, Baltimore, MD

**INTRODUCTION:** Patients who are obese (BMI≥30kg/m$^2$) with septic shock may have altered vancomycin pharmacokinetics (PK), when compared to the general population. Specifically, hydrophilic antimicrobials (ie, vancomycin), may have increased volume of distribution (Vd), decreased protein binding, and altered renal clearance. These changes may result in improper dosing or inadequate concentrations. Currently, there is a lack of published literature evaluating vancomycin PK and pharmacodynamics (PD) in obese septic shock patients.

**RESEARCH QUESTION OR HYPOTHESIS:** To characterize vancomycin PK-PD in adult obese patients with septic shock.

**STUDY DESIGN:** Prospective, observational, single center study.

**METHODS:** Serum vancomycin concentrations (4 levels per patient) were collected within the first 72 hours. Additional data collected included: age, weight, gender, severity of illness, creatinine clearance (CrCL), infectious source, and outcomes. Non-compartment PK analysis was conducted on concentration-time data available using Phoenix software. The following population vancomycin PK were used for comparison: Vd=0.7L/kg; $K_e$=0.087hr$^{-1}$.

**RESULTS:** Nine patients (67% males) were enrolled, with a median (IQR) age of 66 years (51-69), BMI of 37.3kg/m$^2$ (32.8-43), CrCl of 44.6mL/min (26.5-68.7), APACHE II of 27 (24-34), and SOFA score of 13 (10-15). Seven patients had acute renal failure. Infection sources included pneumonia (n=4), gastrointestinal (n=3), skin and soft tissue (n=1), and bacteremia of unknown source (n=1). No patients received a loading dose. Median (IQR) initial dose was 16mg/kg (15-18.5). Median (IQR) PK parameters were: $k_e$=0.07hr$^{-1}$ (0.03-0.11), $t_{1/2}$=10.7hr (6.2-23), Cl=2.43L/hr (1.44-6.06), and Vd=0.48L/kg (0.42-0.53). Median (IQR) trough was 17.6 (12.1-21) mcg/mL. The

median (IQR) AUC was 720 (269-1064). Clinical cure was 66.7% and hospital mortality was 22.2%.

**CONCLUSION:** Based on the results of this study, obese patients with septic shock have similar PK parameters compared to the general PK population.

**389. The impact of proximal roux-en-y gastric bypass surgery on acetaminophen absorption and metabolism** Kuan-Fu Chen, BS, MS[1], Taurence Senn, BS, MS[2], Brant Oelschlager, MD[3], David Flum, MD, MPH[3], Danny Shen, Ph.D.[1], John Horn, Pharm.D.[4], Yvonne Lin, Ph. D.[1], *Lingtak-Neander Chan, Pharm.D.*[4]; [1]Department of Pharmaceutics, University of Washington, Seattle, WA [2]Department of Medicinal Chemistry, University of Washington, Seattle, WA [3]Department of Surgery, University of Washington, Seattle, WA [4]Department of Pharmacy, University of Washington, Seattle, WA

**INTRODUCTION:** Bariatric surgery is one of the most effective medical interventions for the treatment of obesity and 45% of patients undergo Roux-en-Y gastric bypass surgery (RYGBS) that surgically alters the stomach and length of small intestine.

**RESEARCH QUESTION OR HYPOTHESIS:** The aim of this study was to determine how Roux-en-Y gastric bypass surgery (RYGBS) affects the absorption and metabolism of acetaminophen.

**STUDY DESIGN:** Twelve morbidly obese received 1.5 g of acetaminophen (APAP) orally on three separate pharmacokinetic study days (i.e., pre-RYGBS baseline, 3-month, and 12-month post-RYGBS).

**METHODS:** Plasma was collected at pre-specified time points over 24 hrs and the samples were analyzed using liquid chromatography-mass spectrometry for APAP, APAP-glucuronide (APAP-gluc), APAP-sulfate (APAP-sulf), APAP-cystein (APAP-cys), and APAP-*N*-acetylcystein (APAP-nac).

**RESULTS:** Peak concentrations of APAP increased by over 2-fold following RYGBS. Peak concentrations of APAP-gluc and APAP-sulf were increased to a smaller extent (range: 1.2 to 1.5-fold) following RYGBS, whereas peak concentrations of APAP-cys and APAP-nac were unchanged. In contrast to peak concentrations of APAP, there were no major differences in weight-normalized clearance, weight-normalized volume of distribution or terminal half-life of APAP pre- and post-RYGBS. Interestingly, the metabolite-to-parent ratios of all four metabolites were decreased at 3- and12-months post-RYGBS.

**CONCLUSION:** RYGB caused a rapid increase in the rate of absorption of APAP and a possible decrease in the activities of CYP2E1 and Phase II enzymes.

**390. Therapeutic equivalence of generic product versus reference product of ivabradine in patients with chronic heart failure: a cross-over study** Hadeer Eliwa, bachelor degree of pharmaceutical sciences and pharmaceutical industries[1], Naglaa Bazan, Ph.D.[2], *Ebtissam Darweesh, MD*[3], Nagwa Sabri, Ph.D.[4]; [1]Pharmacy Practice and Clinical Pharmacy Department/Faculty of pharmaceutical sciences and pharmaceutical industries, Future university in Egypt, Cairo-Egypt, Egypt [2]Critical Care Medicine Department, Cairo University Hospitals, Cairo-Egypt, Egypt [3]Pharmacy Practice and Clinical Pharmacy Department, Faculty of Pharmaceutical Sciences and Pharmaceutical industries /Future university in Egypt, Cairo-Egypt, Egypt [4]Faculty of Pharmacy/Ain Shams University, Cairo, Egypt

**INTRODUCTION:** Generic substitution of brand ivabradine prescriptions can reduce drug expenditures and improve adherence. However, the distrust of generic medicines by practitioners and patients due to doubts regarding their quality and fear of counterfeiting compromise the acceptance of this practice.

**RESEARCH QUESTION OR HYPOTHESIS:** Is generic ivabradine therapeutically equivalent to brand ivabradine in adult patients with chronic heart failure with reduced ejection fraction (HFrEF)?

**STUDY DESIGN:** A randomized open-label, 2-sequence, 2-period crossover study.

**METHODS:** Thirty-two Egyptian patients with HFrEF were treated with branded ivabradine (Procrolan ©) and generic (Bradipect ©) during 24 (2x12) weeks. Primary outcomes were resting heart rate (HR), NYHA FC, Quality of life (QoL) using Minnesota Living with Heart Failure (MLWHF) and EF. Secondary outcomes were the number of hospitalizations for worsening HFrEF and adverse effects. The washout period was not allowed for ethical reasons.

**RESULTS:** At the 12$^{th}$ week, the reduction in HR was comparable in the two groups (90.13±7.11 to 69±11.41 vs 96.13±17.58 to 67.31±8.68 bpm in brand and generic groups, respectively). Also, the increase in EF was comparable in the two groups (27.44 ±4.59 to 33.38±5.62 vs 32±5.96 to 39.31±8.95 in brand and generic groups, respectively). The improvement in NYHA FC was comparable in both groups (87.5% in brand group vs 93.8% in generic group). The mean value of the QOL improved from 31.63±15.8 to 19.6±14.7 vs 35.68±17.63 to 22.9±15.1 for the brand and generic groups, respectively. Similarly, at end of 24 weeks, no significant changes were observed from data observed at 12$^{th}$ week regarding HR, EF, QoL and NYHA FC. Only minor side effects, mainly phosphenes, and a comparable number of hospitalizations were observed in both groups.

**CONCLUSION:** The study revealed no statistically significant differences in the therapeutic effect and safety between generic and branded ivabradine. We assume that practitioners can safely interchange between them for economic reasons.

**391E. Clinical and pharmacokinetic outcomes of peak-trough-based versus trough-only-based vancomycin therapeutic drug monitoring approaches: a pragmatic randomized controlled trial** Fatima Al-Sulaiti, MSc[1], Ahmed Mohamed Nader, BS(Pharm), MSc, Ph.D., BCPS[2], *Mohamed Saad, Pharm.D., BCPS*[3], Hani Abdelaziz, Pharm.D., BCPS[4], Adila Shaukat, MBBS, CABM, MRCP[5], Rakesh Parakadavathu, MD[6], Ahmed Elzubair, MSc[7], Daoud Al-Badriyeh, Ph.D.[8], Hazem Elewa, Ph. D., RPh, BCPS[1], Ahmed Awaisu, B.Pharm, Ph.D.[1]; [1]College of Pharmacy, Qatar University, Doha, Qatar [2]Division of Clinical Pharmacology, Indiana University, Indianapolis, IN [3]Clinical Pharmacy Department, Al-Wakrah Hospital, Hamad Medical Corporation, Doha, Qatar [4]Emergency Medicine, Al Wakra Hospital, Hamad Medical Corporation, Doha, Qatar [5]Infectious Diseases Department, Al-Wakrah

Hospital, Hamad Medical Corportaion, Doha, Qatar [6]Infectious Diseases Department, Hamad General Hospital, Hamad Medical Corporation, Doha, Qatar [7]Clinical Pharmacy Department, Al-Khor Hospital, Hamad Medical Corporation, Al-Khor, Qatar [8]Clinical Pharmacy and Practice Section, College of Pharmacy, Qatar University, Doha, Qatar
Presented at 2018 ACCP Virtual Poster Symposium; Best Poster Award Winner

## PSYCHIATRY

**392. Accessibility and safety of antipsychotics in the treatment of autism spectrum disorder in children and adolescents** Shaista Sadaf, B.Pharm, Luana Mifsud Buhagiar, B.Pharm.(Hons)(Melit.), M.Pharm.(Melit.), Maresca Attard Pizzuto, B.Pharm.(Hons)(Melit.), M.Sc. (Melit.), Ph.D.(Melit.) and *Anthony Serracino-Inglott*, *B.Pharm.*, *Pharm.D.(Cinc.)*, *M.A.C.C.P.*, *M.R.Pharm.S.*; Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Msida, Malta

**INTRODUCTION:** The FDA approved risperidone and aripiprazole for the treatment of irritability associated with Autism Spectrum Disorder (ASD) in children and adolescents. Cultural and economic differences in countries like India and Malta may affect the prescription of these drugs in ASD.

**RESEARCH QUESTION OR HYPOTHESIS:** Are risperidone and aripiprazole easily accessible in India and Malta? Is it safe to prescribe these drugs in this cohort? Do ASD screening tools influence the prescribing behaviour of these drugs?

**STUDY DESIGN:** Cross-sectional study

**METHODS:** Availability, price and national policies were compared in India and Malta to study the accessibility of risperidone and aripiprazole. Safety signals were accessed from the European Pharmacovigilance system and were assessed using the French causality assessment. The Indian Scale of Assessment of Autism (ISAA) and the Childhood Autism Rating Scale (CARS) were compared by developing and validating an ASD comparative questionnaire (ASD-$Q_{IND-MT}$) intended for psychiatrists (India, Malta) and consisting of 140 close-ended questions

**RESULTS:** Risperidone and aripiprazole are available in India and but are not indicated for ASD and the cost difference between a single tablet of the same strength and dosage form is €0.04 and €0.07 respectively. The French causality assessment of the detected signals (141-aripiprazole and 177-risperidone) concluded uncertain/ unlikely relationship between the signal and the drugs. ASD-$Q_{IND-MT}$ was disseminated to psychiatrists in India (n=31) and Malta (n=16) and a larger percentage (41.9 %) of psychiatrists in India agreed that screening tools have a positive influence on the prescribing behaviour compared to psychiatrists in Malta (12.5 %)

**CONCLUSION:** Accessibility of drugs to the patient is affected by the high cost which can be lowered by including risperidone and aripiprazole on national formularies for the indication of ASD. It is safe to prescribe these drugs in this cohort but continuous monitoring is recommended. Cultural and economic differences significantly affect the approach towards treatment of ASD in different countries

**393. Benzodiazepine monotherapy in patients with depression: a national cross-sectional study** *Mate Soric*, *Pharm.D.*[1], Chris Paxos, Pharm.D.[2], Sara Dugan, Pharm.D., BCPP, BCPS[1], Susan Fosnight, RPh[3], Jodie Turosky, R.Ph., BCPS[4], Jessica Emshoff, Pharm.D.[2], Prabodh Sadana, Ph.D.[1], Lukas Everly, Pharm.D., BCPS[5], Brittany Snyder, Pharm.D.[5], Bhavin Mistry, Pharm.D.[2], Shubha Bhat, Pharm.D.[6], Amy Unruh, Pharm.D. Candidate[7], Ismail Safi, Pharm.D. Candidate[8]; [1]Department of Pharmacy Practice, Northeast Ohio Medical University, Rootstown, OH [2]Cleveland Clinic Akron General, Akron, OH [3]Northeast Ohio Medical University and SUMMA Akron City Hospital, Rootstown, OH [4]Department of Pharmacy Practice, Northeast Ohio Medical University and St. Vincent Charity Medical Center, Rootstown, OH [5]University Hospitals Geauga Medical Center, Chardon, OH [6]University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO [7]College of Pharmacy, Northeast Ohio Medical University, Rootstown, OH [8]Northeast Ohio Medical University, Rootstown, OH

**INTRODUCTION:** Benzodiazepines are linked to increased risk of depressive symptoms, suicide attempts and dependence. Depression guidelines discourage benzodiazepine monotherapy and limit use to short-term adjunctive therapy with antidepressants. However, patients with depression continue to receive benzodiazepine monotherapy. The prevalence and predictors of this prescribing pattern have not been described previously so that clinicians can characterize the patient population at highest risk.

**RESEARCH QUESTION OR HYPOTHESIS:** What percentage of adults treated for depression are prescribed benzodiazepine monotherapy and what variables predict this usage pattern?

**STUDY DESIGN:** National cross-sectional analysis of the National Ambulatory Medical Care Survey from 2012-2015.

**METHODS:** All office visits for patients aged >18 treated for depression were included in the analysis. Office visits involving patients with bipolar disorder, schizoaffective disorder, or pregnancy were excluded. The primary endpoint was benzodiazepine monotherapy prescribing rate defined as initiation or continuation of a benzodiazepine in the absence of any other antidepressant agent. In order to identify predictors of use, a multivariate logistic regression model was created to identify variables significantly associated with benzodiazepine monotherapy.

**RESULTS:** In total, 9,426 unweighted visits were eligible for inclusion, representing more than 192 million weighted visits. Benzodiazepine monotherapy was present in 9.3% of patients treated for depression (95% CI 8.2-10.6%). Predictors of benzodiazepine monotherapy included patients aged 45-64 (OR 1.51; 95% CI 1.03-2.22 compared to patients aged 25-44), epilepsy-related office visit (OR 7.32; 95% CI 1.81-29.58), anxiety-related office visit (OR 1.69; 95% CI 1.17-2.45), underlying pulmonary disease (OR 1.46; 95% CI 1.10-1.96), and concomitant opiate prescribing (OR 2.93; 95% CI 1.94-4.42). Psychiatry specialists were less likely to prescribe benzodiazepine monotherapy (OR 0.40; 95% CI 0.25-0.64 compared to primary care providers).

**CONCLUSION:** Benzodiazepine monotherapy is utilized in nearly 1 in 10 patients treated for depression. Older adults, opiate users, patients

seen by primary care providers and those with underlying anxiety, epilepsy or pulmonary disorders are at highest risk.

**394. Gut microbial community structure varies with atypical antipsychotic treatment and with resistant starch in a bipolar and schizophrenia cohort** *Stephanie Flowers, Pharm.D., Ph.D.*[1], A. Zarina Kraal, MS[2], Kristen Ward, Pharm.D.[2], Vicki Ellingrod, Pharm.D., FCCP[2]; [1]Pharmacy Practice, University of Illinois at Chicago, Chicago, IL [2]Clinical Pharmacy Department, College of Pharmacy, University of Michigan, Ann Arbor, MI

**INTRODUCTION:** Cardiovascular disease (CVD) and metabolic abnormalities are major causes of mortality among those treated with atypical antipsychotics (AAPs). Previous studies identify shifts in gut microbiota associated with AAP-treatment, which may link AAPs to metabolic burden. Dietary prebiotics, like resistant starch (RS) may be beneficial in obesity and diabetes, but little is known about its ability to modify gut microbiota in AAP-treated individuals. We performed a clinical study to determine the effects of AAP-treatment and RS on body composition, diet and gut microbiota in a psychiatric population.

**RESEARCH QUESTION OR HYPOTHESIS:** Our hypothesis that AAP treatment and resistant starch results in measurable differences in gut microbiota composition in a well-characterized clinical population.

**STUDY DESIGN:** Comparison of microbial community structure from stool collected from AAP and non-AAP treated participants.

**METHODS:** Stool from participants with a serious mental illness were subject to 16S sequencing. Inter- and Intra- group diversity measures were performed by PERMANOVA and Inverse Simposon Diversity Index, respectively. Differentially abundant organisms were detected using linear discriminant analysis of effect size. Anthropometric measurements, diet, and endothelial functioning were measured before and after 14 days of RS.

**RESULTS:** We recruited 37 participants (57% male, age(mean)=52.2 (+/-12.5), 57% receiving AAPs) for this study. While no significant separation in microbiota communities was detected at baseline between AAP-users and non-users, non-AAP users showed increased fractional representation of *Alistipes*. AAP-treated females exhibited decreased diversity when compared with non-AAP-treated females. Responses to RS varied among AAP-treated participants, with increased abundance of the *Actinobacteria* phylum observed in response to RS.

**CONCLUSION:** These data suggest that AAP treatment associates with specific representation of gut microbiota in AAP-treated patients and decreased species richness in female AAP-treated patients. Our cohort exhibited variable responses to RS supplementation with significant increase in starch degraders.

**395E. Aripiprazole lauroxil nanocrystal dispersion: a potential 1-day initiation regimen for long-acting aripiprazole lauroxil** *Angela Wehr, Ph.D.*[1], David Walling, Ph.D.[2], Marjie Hard, Ph.D.[1], Yangchun Du, Ph.D.[1], Peter Weiden, MD[1], Lisa von Moltke, MD[1]; [1]Alkermes, Waltham, MA [2]CNS Network, Garden Grove, CA

Presented at the 73rd Society of Biological Psychiatry Annual Meeting May 10-12 2018, New York City, NY, USA Presented May 11 2018.

**396E. Effects of parental psychiatric stress on a child's OUD development in young adulthood** *Christopher LaFratte, BSPS*[1], Jessica Hu, BSPS[1], Maureen Reynolds, Ph.D.[2], Levent Kirisci, Ph.D.[2]; [1]School of Pharmacy, University of Pittsburgh, Pittsburgh, PA [2]University of Pittsburgh, Pittsburgh, PA

Presented at University of Pittsburgh Department of Psychiatry Research Day, Pittsburgh, Pennsylvania, June 7, 2018.

**397. Suicide prevention training for student pharmacists** *Nathan A. Painter, Pharm.D., CDE, FAADE*[1], Grace M. Kuo, Pharm.D., MPH, Ph.D.[2], Kelly Lee, Pharm.D., MAS, BCPP, FCCP[3]; [1]Skaggs School of Pharmacy and Pharmaceutical Sciences, University of California, San Diego, La Jolla, CA [2]UCSD, La Jolla, CA [3]Skaggs School of Pharmacy and Pharmaceutical Sciences, University of California San Diego, La Jolla, CA

**INTRODUCTION:** Suicide in the US is a major preventable public health problem. Pharmacists need to be educated on suicide prevention strategies to increase their own awareness and identify patients at-risk. A training program for student pharmacists was used to improve recognition of a crisis and warning signs of suicide.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the effect of suicide prevention training on the participant's general perception, self-efficacy, and attitude?

**STUDY DESIGN:** A longitudinal prospective survey used to evaluate suicide prevention training sessions provided to student pharmacists.

**METHODS:** A self-administered post-survey was given to participants of the suicide training program. Descriptive statistics were used to describe demographics, self-efficacy, and attitudes. Nonparametric Wilcoxon signed rank analyses for matched pairs were used to compare attitudes before and after trainings. Regression analyses were conducted to assess factors associated with self-efficacy and attitudes.

**RESULTS:** Survey responses were completed by 126 student pharmacists. Their average age was 24 $\pm$ 3 years (range, 21-37 y), 51% were male, and 67% were Asian. Regarding self-efficacy of suicide prevention, greater than 90% of respondents felt somewhat or extremely confident in identifying signs of suicide, listening without judgement, and providing resources for suicide prevention, but only 67% in deciding whether medical intervention is necessary. The overall mean scores of attitude to update their knowledge in suicide prevention before and after training were 1.9 $\pm$ 1.1 and 3.6 $\pm$ 0.8 ($P < 0.001$), respectively. The overall mean scores of attitude to make appropriate interventions in suicide prevention before and after training were 2.7 $\pm$ 0.1 and 4.2 $\pm$ 0.1 ($P < 0.001$), respectively. Regression analyses showed several demographic factors were statistically significantly associated with self-efficacy and attitudes.

**CONCLUSION:** A training program helped student pharmacists build confidence in several self-efficacy areas and improved attitudes in suicide prevention

**398. Evaluation of pre-emptive metabolic risk management by a pharmacist in the inpatient behavioral health unit** Shedrick Martin, Pharm.D., *Kimberly Tallian, Pharm.D.. BCPP, FASHP, FCCP, FCSHP*, Harminder Sikand, Pharm.D., FCCP, FASHP; Department of Pharmacy, Scripps Mercy Hospital, San Diego, CA

**INTRODUCTION:** Mental health patients prescribed antipsychotics have a high risk of metabolic syndrome leading to cardiovascular disease and death. Inconsistent monitoring and treatment of metabolic conditions can further complicate their prognosis.

**RESEARCH QUESTION OR HYPOTHESIS:** Will pre-emptive pharmacist metabolic monitoring lead to increased identification of metabolic risks in patients prescribed antipsychotics?

**STUDY DESIGN:** Single institution, real-world, single arm, concurrent intervention with retrospective analysis.

**METHODS:** Patients from November 1, 2017 to February 23, 2018 admitted to the behavioral health unit (BHU) were included. Inclusion criteria: age ≥ 18, prescribed antipsychotics, history of psychiatric disorder, and length of stay ≥ 3 days. Exclusion criteria: refusing laboratory draws and unscheduled antipsychotics. Patients were evaluated by a pharmacist based on presence of fasting lipid panel and hemoglobin A1c within 12 months. If values were unavailable the pharmacist ordered recommended labs. Goal metabolic laboratory parameters were defined as LDL-C <190mg/dl, triglycerides <500mg/dl, and hemoglobin A1c <6.5%. Values not meeting goal parameters triggered pharmacist to notify the physician to initiate or optimize therapy. The primary end point was number of identified intervention opportunities. Secondary endpoints included CMS regulatory adherence and number of interventions accepted by physician.

**RESULTS:** A total of 394 patients were enrolled and 194 met inclusion criteria. Patients were primarily Caucasians aged 44 years prescribed at least one antipsychotic. Approximately 22 opportunities to intervene were identified by abnormal laboratory measurements including triglycerides (n=1, 4.5%), LDL-C (n=2, 9%) hemoglobin A1c (n=19, 86.5%). A physician intervened or was contacted to intervene for 90.9% of patients with laboratory measurements not in goal. Approximately 45.5% of pharmacist recommendations were accepted by physician. Pharmacist intervention led to 95.4% CMS regulatory adherence, identified 59% of patients requiring intervention, and decreased unmanaged patients by 25%.

**CONCLUSION:** Pharmacist initiated metabolic monitoring can effectively identify opportunities to intervene for metabolic abnormalities in the hospital setting in patients taking antipsychotics to optimize therapy.

## PULMONARY

**399. Evaluation of risks vs benefits with concomitant use of budesonide nebulizers and systemic corticosteroids in COPD exacerbations** *Joseph Hill, Pharm.D. Candidate*[1], Jon P. Wietholter, Pharm.D., BCPS[2]; [1]West Virginia University School of Pharmacy, Morgantown, WV [2]Department of Clinical Pharmacy, West Virginia University School of Pharmacy, Morgantown, WV

**INTRODUCTION:** Systemic corticosteroids are recommended for treatment of chronic obstructive pulmonary disease (COPD) exacerbations. Studies suggest that nebulized budesonide may be equivalent to systemic corticosteroids in COPD exacerbations. To date no data on the benefits or risks of concomitant nebulized and systemic corticosteroids during COPD exacerbations exists.

**RESEARCH QUESTION OR HYPOTHESIS:** Do concomitant budesonide nebulizers and systemic corticosteroids decrease length of stay in COPD exacerbations?

**STUDY DESIGN:** Single-centered, retrospective chart review study evaluating patients admitted to WVU Medicine between September 20th 2015- July 30th 2017 with a COPD exacerbation receiving systemic corticosteroids plus or minus nebulized budesonide.

**METHODS:** Patients were included if they: a) had a COPD exacerbation classified via ICD9 and/or ICD10 code(s), b) received systemic corticosteroids at 40 mg of prednisone equivalents per day for 48 hours upon admission, and c) received nebulized budesonide for 48 hours if in the budesonide arm. Exclusion criteria included asthma, active cancer or immunosuppression, systemic corticosteroids within 4 weeks, or active fungal infection(s). The primary outcome was to compare length of stay between groups that received nebulized budesonide and those that didn't. Secondary outcomes were to compare adverse effect rates between groups. Graphpad.com was used to calculate statistical data and significance was defined as $p < 0.05$.

**RESULTS:** 645 patient charts were reviewed and 75 patients were included (n=41 in the budesonide group; n=34 in the non-budesonide group). Regarding the primary outcome, length of stay averaged 4.63 and 3.62 days ($p = 0.183$) in the budesonide and non-budesonide arms, respectively. Regarding secondary outcomes, hyperglycemic events occurred significantly more frequently in the budesonide group (n=164 vs. 92 ($p = 0.0199$)). Number of thrush diagnoses were not significantly different (n=4 vs. 0 ($p = 0.1215$)).

**CONCLUSION:** Giving nebulized budesonide in addition to systemic corticosteroids during a COPD exacerbation does not decrease hospital length of stay and significantly increases the risk of hyperglycemic events.

**400. Chronic obstructive pulmonary disease exacerbations: a hospital-based study** Jessica Spiteri, B.Sc. Pharm. Sci. (Hons.) M.Pharm.[1], Louise Grech, B.Pharm (Hons), MPhil, Ph.D, MRPharmS[1], Stephen Montefort, MD, Ph.D.(S'ton.), F.R.C.P.(Lond.), F.R.C.P.(Edin.), F.R.C.P.(Glas.), F.A.C.P., F.E.F.I.M, F.C.C.P.[2], *Lilian M. Azzopardi, BPharm. (Hons.). MPhil., Ph.D.., MRPharmS, FFIP*[3]; [1]Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Msida, Malta [2]Department of Medicine, Mater Dei Hospital, Msida, Malta [3]Department of Pharmacy, University of Malta, Msida, Malta

**INTRODUCTION:** Health care resource utilisation data for chronic obstructive pulmonary disease (COPD) exacerbation-related

hospitalisations can be used to drive the introduction of long-acting muscarinic antagonists (LAMAs) on local formularies.

**RESEARCH QUESTION OR HYPOTHESIS:** This study aimed at identifying COPD exacerbations leading to hospitalisation and the resulting costs.

**STUDY DESIGN:** A 3-month observational cohort-study carried out at Mater Dei Hospital. Hospitalisation was defined by an admission to a medical ward or Intensive Therapy Unit (ITU).

**METHODS:** A data collection proforma was designed and validated. This included data pertaining to patient demographics, clinical variables, and use of hospital resources. All the hospital admissions during February-April 2017 were screened and those flagged as COPD exacerbations noted. Exclusion criteria included the presence of consolidations on chest x-ray and instances where the diagnosis on the discharge letter differed from the initial diagnosis of COPD exacerbation. Clinical data was obtained from patients' files whilst economic data was obtained from the hospital's administrative and finance departments. Cost estimates using an activity-based costings approach was computed.

**RESULTS:** A total of 148 COPD exacerbation-related hospitalisations met the study's inclusion criteria. Out of these only 16.9% were on LAMA therapy, indicating a low number of patients on optimum therapy. The length of hospital stay ranged from 1-44 days with the median being 4 days. Nine patients required non-invasive ventilation and 3 patients required ITU admission. The length of hospital stay showed significantly positive correlation with the number of comorbidities and BAP-65 scores respectively (Pearson correlation 0.198, 0.199; p-value=0.016, 0.015). The estimated total cost for COPD exacerbation-related hospitalisation amounted to €225,000.

**CONCLUSION:** The cost estimation of COPD exacerbation-related hospitalisations gives the opportunity of measuring their impact on healthcare resource use. Health care policy-makers may use this information to carry out a cost-benefit analysis for widespread local LAMA use.

**401. Room temperature stability and aerosol characterization of revefenacin inhalation solution, a novel once-daily long-acting muscarinic antagonist for nebulization** Edmund Moran, Ph.D., Vijay Sabesan, MS, *James Wertman, MS*, Kenley Ngim, Ph.D.; Theravance Biopharma US, Inc., South San Francisco, CA

**INTRODUCTION:** Phase 3 trials established the efficacy and safety of once-daily revefenacin inhalation solution (REV) administered via standard jet nebulizer (JN) in patients with moderate to very severe COPD.

**RESEARCH QUESTION OR HYPOTHESIS:** This study evaluated the room temperature (RT) stability and aerosol characterization of REV for use in standard JNs.

**STUDY DESIGN:** Stability studies were conducted on REV 88 μg/3 mL and 175 μg/3 mL strength batches at 25°C/60% relative humidity (RH) for up to 18 months and 40°C/75% RH conditions for up to 6 months.

**METHODS:** For aerosol characterization, two JNs (PARI LC Plus and the PARI LC Sprint) were utilized to assess REV, and compared with published data from the very similarly formulated commercial products Brovana (arformoterol tartrate) and Perforomist (formoterol fumarate), both of which are indicated for use in a standard JN. The delivered dose (DD) and fine particle fraction (FPF) for REV were measured for the 88 μg/3 mL and 175 μg/3 mL strengths.

**RESULTS:** REV stability-indicating attributes demonstrated its stability for at least 18 months at the RT storage condition when stored in its foil pouch, and for at least 14 days when removed from the foil pouch. REV aerosol performance data for DD and FPF in the two JNs tested were consistent with two established commercial bronchodilator products and were within the nebulizer performance ranges observed in independent studies. Using the PARI LC Sprint nebulizer connected to a PARI Trek S compressor and a breathing simulator under in vitro conditions, the mean DD from the mouthpiece was approximately 35% of label claim. The mean nebulization time was 8 minutes.

**CONCLUSION:** REV demonstrated stability at RT for at least 18 months and showed aerosol performance characteristics that demonstrated that REV is suitable for administration using a standard jet nebulizer.

**402. Quality assessment of youtube videos as a guide for respimat soft misttm inhaler technique** *Sarah T. Eudaley, Pharm.D., BCPS*[1], Shelby Brooks, Pharm.D. Candidate 2019[1], Hannah Rovin, Pharm.D. Candidate 2020[1], Shaunta M. Chamberlin, Pharm.D., BCPS, FCCP[2]; [1]Department of Clinical Pharmacy and Translational Science, University of Tennessee Health Science Center, College of Pharmacy, Knoxville, TN [2]Department of Family Medicine, University of Tennessee Graduate School of Medicine, Knoxville, TN

**INTRODUCTION:** The Respimat Soft Mist inhaler is the delivery device for four inhalers on the US market used to treat asthma/COPD. Although widespread access to the internet is convenient, available health-related material may lead patients to inaccurate information. Therefore, it is important to assess quality and accuracy of online information.

**RESEARCH QUESTION OR HYPOTHESIS:** Assess quality and accuracy of Respimat Soft Mist inhaler YouTube videos.

**STUDY DESIGN:** YouTube was queried on May 16, 2018 using the search term "Respimat inhaler". Descriptive statistics were used for data analysis.

**METHODS:** The first 40 videos returned, in English, demonstrating instructions for use were evaluated using a published, validated rating scale that assessed technical quality. Content was assessed using information provided by the manufacturer/package insert.

**RESULTS:** Most videos (n=27, 68%) were from a professional organization intended for laypersons (n=39, 98%). Seventy percent (n=28) were of adequate quality. No video evaluated included all steps for use, which include preparation for first time use, priming, and daily use. All steps for preparing for first time use were included in 25% (n=10) of videos, with recording a discard date most commonly omitted (73%, n=29). Forty percent (n=16) included all steps for priming,

with the most commonly omitted step repeating until spray is visible (50%, n=20). Only 10% (n=4) included all steps for daily use. Most commonly omitted steps included removing the inhaler during breath hold (78% (n=31) and breathing out away from mouthpiece (73% (n=29). Of note, 60% (n=24) did not include instruction to point inhaler to back of throat.

**CONCLUSION:** Proper inhaler technique is crucial for patients to achieve optimal results from inhaled medications. While many videos are widely available for demonstration of Respimat inhaler technique, most omit key steps for proper use. Therefore, thorough and repetitive patient education should be provided in addition to reputable, vetted sources that ensure online consumers gain accurate information.

**403. Association between comorbid cancer and use of thrombolysis in acute pulmonary embolism** Kevin Hakamiun, Pharm.D. Candidate, Hannah Leschorn, Pharm.D. Candidate, Sofia Butt, Pharm.D. Candidate, Emmeline Tran, Pharm.D., *Erin Weeda*, *Pharm.D.*, *BCPS*; Medical University of South Carolina, Charleston, SC

**INTRODUCTION:** Approximately 15-20% of patients presenting with venous thromboembolism have cancer. Thrombolysis is a treatment option for pulmonary embolism (PE) in patients with hypotension. However, patients with cancer may be at increased risk of bleeding and little is known about the use of thrombolysis in these patients.

**RESEARCH QUESTION OR HYPOTHESIS:** To evaluate the relationship between comorbid cancer and the use of thrombolysis for acute PE treatment.

**STUDY DESIGN:** Retrospective cohort study utilizing administrative data.

**METHODS:** The 2013 and 2014 United States National Inpatient Sample was used to identify adult patients hospitalized for acute PE. Identified admissions were stratified based on the presence or absence of comorbid cancer. Multivariable logistic regression was performed to determine the association between comorbid cancer and the odds of receiving thrombolysis after adjustment for patient- and hospital-level covariates. The association between comorbid cancer and the odds of in-hospital mortality (after adjusting for age≥65 years and sex) in those that received thrombolysis was also determined.

**RESULTS:** We identified 72,546 admissions for acute PE; of which, 14.7% (n=10,673) had comorbid cancer. A total of 3.4% (n=2,439) of patients received thrombolysis. Upon multivariable adjustment, comorbid cancer was associated with decreased odds of receiving thrombolysis (adjusted odds ratio [aOR]=0.52; 95% confidence interval [CI]=0.45-0.60). In-hospital mortality occurred in 12.9% (n=315) of patients receiving thrombolysis and was no different in those with versus without comorbid cancer (aOR=1.35; 95%CI=0.93-1.96).

**CONCLUSION:** Comorbid cancer was associated with a decreased odds of receiving thrombolysis for acute PE. As PE is a common complication among patients with cancer, clinical data sets should be used to characterize the use of thrombolysis in this patient population.

**404. Characteristics of adult patients with persistent asthma and frequent refills of inhaled beta-agonists** *Catherine Riggs*, *Pharm.D.*, *BCACP*[1], Bruce Bender, Ph.D.[2], Glenn Goodrich, MS[3], Courtney Anderson, MPH[3], Susan Shetterly, MS[3], Marsha Raebel, Pharm.D.[3]; [1]Kaiser Permanente Colorado, Aurora, CO [2]Division of Pediatric Behavioral Health, National Jewish Health, Denver, CO [3]Institute for Health Research, Kaiser Permanente Colorado, Aurora, CO

**INTRODUCTION:** Beta-agonist overuse is associated with increased asthma exacerbations. Identifying characteristics associated with beta-agonist overuse can inform asthma management.

**RESEARCH QUESTION OR HYPOTHESIS:** Do adult patients with persistent asthma who frequently refill inhaled beta-agonists differ from adult patients with persistent asthma who refill beta-agonists less frequently?

**STUDY DESIGN:** This investigation was part of a pragmatic randomized trial conducted at Kaiser Permanente Colorado, an integrated care delivery system providing medical care for approximately 600,000 patients in the Denver-Boulder metropolitan area.

**METHODS:** The study included patients age ≥ 18 with persistent asthma and without COPD. We compared patients who overfilled a beta-agonist (filling more frequently than every 60 days) during the 12-month study period to those who overfilled 1 and 2 or more times. Continuous data were analyzed using Kruskall-Wallis tests and categorical data were analyzed using chi-square tests.

**RESULTS:** The study included 12,475 patients. Patient characteristics associated with overfilling included younger age ($p < 0.001$), Hispanic ethnicity ($p = 0.002$), current smoking ($p < 0.001$), less than high school education ($p < 0.001$), and lower median income ($p < 0.001$). Patients who overfilled beta-agonists had a lower ratio of asthma controller medications to the total of asthma reliever plus asthma controller medications (Asthma Medication Ratio; AMR) ($p < 0.001$), and had less well-controlled asthma, as defined by filling more corticosteroid bursts ($p < 0.001$) and more after-hours ($p < 0.001$) and ER visits ($p < 0.001$) for asthma.

**CONCLUSION:** Beta-agonist overfill was higher among patients who were younger, Hispanic, smokers, and had lower socioeconomic status. Patients who overfilled beta-agonists had lower AMRs. Higher AMR is associated with better asthma outcomes. Patients who overfilled beta-agonists also had more corticosteroid bursts and more after-hours and ER utilization for asthma. Taken together, these results suggest there are opportunities to improve asthma control among patients who overfill beta agonists.

**405. Assessment of spacer & action plan usage in asthma management at the bustamante hospital for children** *Amanda Daley*, *Pharm.D.*[1], Lisa Bromfield, Pharm.D.[2]; [1]Pharmacy, Bustamante Hospital for Children, Kingston, Jamaica [2]School of Pharmacy, University of Technology, Jamaica, Kingston, Jamaica

**INTRODUCTION:** The use of spacers with metered dose inhalers (MDIs) and written asthma action plans are considered important tools for effective management of asthma in children. A significant portion of caregivers, i.e. 68% of the participants, inappropriately

managed asthma exacerbation in children (Clayton et al., 2012). This research assesses the extent of spacer and the prevalence of asthma action plan usage in asthma management at the Bustamante Hospital for Children (BHC).

**RESEARCH QUESTION OR HYPOTHESIS:** What percentage of asthmatic children utilizes a spacer with a MDI? How prevalent is the use of a written asthma action plan at BHC?

**STUDY DESIGN:** A cross-sectional, prospective study was conducted using purposive sampling.

**METHODS:** Participants included 50 caregivers of children with asthma at BHC medical clinic and 6 physicians. Informed consent was obtained. Questionnaires and interviews were used to collect data in a confidential room over the period June to August 2016. Quantitative and qualitative data were analyzed using the SPSS version 21 software.

**RESULTS:** The findings showed that spacers were used at least a few of the times by 46 (92%) caregivers but were always used by only 25 (50%). Majority of the caregivers (n=49, 98%) did not demonstrate all the required steps of proper inhalation technique. There was an average number of caregivers (n=37, 74%) who owned an asthma action plan but its use was low. This tool was viewed positively by 26 of them. All 6 physicians perceived the use of spacers and asthma action plans as important and beneficial for the management of asthma in children.

**CONCLUSION:** The use of spacers among caregivers of children with asthma at BHC medical clinic was very high, however, compliance with its use was low. The number of caregivers who owned an asthma action plan was average and compliance with its use was low.

## SUBSTANCE ABUSE/TOXICOLOGY

**406. Cannabis product preferences and indications among medical and non-medical users** *Scott Coon, Pharm.D.*[1], Kim Hoffman, Ph.D.[2], Javier Ponce Terashima, MD[3], John Muench, MD, MPH[4], Dennis McCarty, Ph.D.[2]; [1]Pharmacy Practice, St. Louis College of Pharmacy, St. Louis, MO [2]School of Public Health, Oregon Health & Science University, Portland, OR [3]Department of Psychiatry, University Hospitals Cleveland Medical Center – Case Western Reserve University, Cleveland, OH [4]Department of Family Medicine, Oregon Health & Science University, Portland, OR

**INTRODUCTION:** Cannabis use is approved for medical and recreational use in seven states and the District of Columbia. In Oregon, prevalence of cannabis use has increased from 14% to 23% between 2009 & 2016. Despite increasing and widespread cannabis use, little data exist to help understand how patients are using cannabis and factors guiding product selection. Therefore, we sought to capture basic product information and factors affecting product selection.

**RESEARCH QUESTION OR HYPOTHESIS:** Patients use a variety of cannabis products, the selection of which is influenced by product- and patient-specific characteristics

**STUDY DESIGN:** Survey and focus group

**METHODS:** Between 2016-2017, an 18-item survey was administered using RedCap to participants at an urban Federally Qualified Health Center in Oregon. Following consent, participants worked through the questionnaire independently, followed by a structured interview with the surveyor. Descriptive statistics were calculated using excel.

**RESULTS:** There were 48 participants (100% response rate) who were on average 47 years old, Caucasian, low income, identified cisfemale, and used cannabis more than once daily. Cannabis products varied: inhalation (88%), edible (69%), concentrate (48%), topical (40%), prefilled cartridges (38%), drink (13%), and rectal or vaginal (8%). Among respondents, 97% considered tetrahydrocannabinol (THC) and cannabidiol (CBD) content in products, and 64% stated product and dose preferences changed based on the indication. Using a slider likert scale (0 = [contains] very little; 100 = [contains] a great deal), participants preferred products with higher CBD content (median = 74) than THC (median = 57). Indications varied: pain (83%), relaxation (67%), anxiety (63%), recreational (44%), nausea (42%), other (27%). Legal consequences of use (17%) and adverse emotional (2%) and physical health (4%) effects were infrequent.

**CONCLUSION:** Within our sample, participants self-reported use of a variety of cannabis products, selection of which varies based on content and indication. Reasons for use were more commonly medical with infrequent adverse effects.

**407. Trends in commonly abused medications returned during drug enforcement agency take-back days** *Megan Ritter, Pharm D Candidate*, Anna Wyatt, Pharm D Candidate, Kayce Shealy, Pharm.D., BCPS, BCACP; Presbyterian College School of Pharmacy, Clinton, SC

**INTRODUCTION:** Medication abuse and misuse has been a growing problem in the United States, and was recently deemed a national epidemic. Most of these abused and misused medications are obtained from family or friends who have them in their homes. Proper disposal may reduce medications that are available for misuse and abuse.

**RESEARCH QUESTION OR HYPOTHESIS:** This study sought out to look at the rates of returns as well as trends in returned potentially abused medications.

**STUDY DESIGN:** Retrospective cross-sectional study

**METHODS:** A School of Pharmacy partnered with local law enforcement in a rural South Carolina town to host take-back days from 2013-2016. Data collected on returned items included active ingredient(s), estimated quantity, and prescription fill date if available. The medications were classified therapeutic class and further identified drugs of potential abuse according to NIDA classifications. Descriptive statistics were used to analyze the data collected.

**RESULTS:** In 2013, 742 different medications were returned, and (8.63%) were potential drug of abuse. In the years 2014-2016, 11.43% of returned medications were potential drugs of abuse. In 2017, 13.27% of returned medications were potentially abused drugs. Opioid analgesics were the most commonly potentially abused medication returned, accounting for 51.6%, 62.4%, and 65% of medications returned in 2013, 2014-2016, and 2017 respectively. The other

most commonly returned medications were benzodiazepines (10.9%, 12.8%, 7.5%). The return of hypnotic medications increased over the study period from 0% in 2013 to 12.5% in 2017. The return of other medications such as loperamide and dextromethorphan varied over the study period.

**CONCLUSION:** The rate of potentially abused medications returned steadily rose over the period of the study. Heightened awareness and increased opportunities for proper disposal including the placement of permanent drug disposal locations may account for the decreased number of prescriptions returned following 2013.

**408. Assessment of naloxone stock status in Georgia retail pharmacies** *Rebecca Stone*, *Pharm.D.*, *BCACP*, *BCPS*[1], Stella Hur, Pharm.D. Candidate[2], Henry Young, Ph.D.[1]; [1]Department of Clinical and Administrative Pharmacy, University of Georgia College of Pharmacy, Athens, GA [2]College of Pharmacy, University of Georgia, Athens, GA

**INTRODUCTION:** The opioid epidemic has impacted many communities across the nation; rural communities especially have been hard hit. Naloxone can be a lifesaving medication that patients or their support networks may purchase and have on hand in the event of opioid overdose. However, less is known about the availability of such medications across different communities.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the availability of naloxone in Georgia retail pharmacies? Are there differences in naloxone availability from Georgia retail pharmacies depending upon location and pharmacy type?

**STUDY DESIGN:** Cross-sectional telephone-based survey

**METHODS:** A list of all Georgia retail pharmacies was obtained; 25% were randomly selected, stratified across National Center for Health Statistics rural-urban codes (metropolitan vs. nonmetropolitan), and type (independent vs. chain). Research assistants called pharmacies to assess stock status of naloxone. Descriptive statistics and Chi-square analyses were conducted using SPSS.

**RESULTS:** Of the 511 pharmacies called, 324 participated (63.4%). One hundred and one pharmacists (31%) reported naloxone was currently in stock. There were no differences in stock frequency when comparing pharmacies located in metropolitan and nonmetropolitan areas (34.6% vs 24.5%, p=0.065). Independent pharmacies were less likely to have naloxone stocked compared to chain pharmacies (24.4% vs 35.1%, p=0.044).

**CONCLUSION:** Patients in Georgia face barriers accessing the potentially lifesaving medication naloxone. The majority of retail pharmacies (69%) did not have naloxone stocked. Naloxone availability did not vary by geographic region, however did vary by pharmacy type. Additional strategies are needed to increase access to naloxone in an effort to combat the opioid epidemic.

**409. Methadone use with adherence to inpatient protocols for ordering and approval process** Kristen Nelson, Pharm.D.[1], *Tran Tran*, *Pharm.D.*, *BCPS*[2], Melissa Kocek, Pharm.D.[3]; [1]Pharmacy, Rush University Medical Center, Chicago, IL [2]Department of Pharmacy, Midwestern University, Downer's Grove, IL [3]Rush University Medical Center, Chicago, IL

**INTRODUCTION:** Methadone prescribing is permitted for acute withdrawal and to establish opioid replacement therapy in an inpatient setting. The DEA allows methadone use for treatment of maintenance of acute withdrawal. Providers are permitted to continue methadone for unlimited number of days for patients actively enrolled in a methadone maintenance programs (MMP) when hospital admission is for reasons other than detoxification. Providers are permitted to order methadone for the treatment of pain without restrictions. Ordering must include indication for use in pain control or opioid withdrawal or opioid dependence detoxification.

**RESEARCH QUESTION OR HYPOTHESIS:** Are current methadone ordering practices adherent to inpatient protocols for approval, indication, initiation and continuation of MMP treatment at a large academic medical center?

**STUDY DESIGN:** This was a retrospective chart review of orders placed from January to December 2017 for methadone administrations documented in electronic medical records.

**METHODS:** One-hundred sixty patients received at least one dose of methadone while admitted to the emergency department or an inpatient unit. Data was collected for compliance with hospital protocols for acute withdrawal or for palliative/pain, methadone indication, dose and duration, provider verified MMP enrollment and dosing, psychiatry approval, methadone prescriptions written at discharge, and pharmacy documented initial methadone dose.

**RESULTS:** Twenty-five percent of methadone orders were for pain, 60% was for opioid dependence in patients with prior enrollment in MMP, and 15% was for acute withdrawal with no prior MMP. Only 6% of orders were inappropriate and primarily occurred during weekend and overnight hours. For patients without a prior established MMP, compliance was 96% with hospital protocol, psychiatry approval and documentation, and within maximum dosing allowances.

**CONCLUSION:** This study of hospital methadone prescribing demonstrates high adherence to current methadone protocols in a majority of inpatients. Hospital policy can be improved by addressing methadone ordering instructions for weekends and overnights.

**410. Evaluation of the brief alcohol withdrawal scale protocol at an academic medical center** *Brian Lindner*, *Pharm.D.*[1], Rachel Kruer, Pharm.D.[1], Vi Gilmore, Pharm.D.[2], Sam Young, RN, MS[3], Darius Rastegar, MD[4], Anika Alvanso, MD; MS[5], Edward Chen, MD[3], Timothy Niessen, MD; MPH[6], Keisha Perrin, BSN; RN[7], Paula Murray, RN; MSN[7], Andrew Jarrell, Pharm.D.[1]; [1]Department of Pharmacy, The Johns Hopkins Hospital, Baltimore, MD [2]Department of Pharmacy, The Johns Hopkins Hospital, Balitmore, MD [3]Department of Surgery, The Johns Hopkins Hospital, Baltimore, MD [4]Center for Chemical Dependence, The Johns Hopkins Bayview Medical Center, Baltimore, MD [5]Division of Pulmonary and Critical Care Medicine, The Johns Hopkins Hospital, Baltimore, MD [6]Division of General Internal Medicine, The Johns Hopkins Hospital, Baltimore, MD [7]Department of Medicine, The Johns Hopkins Hospital, Baltimore, MD

**INTRODUCTION:** The standard of care for treatment of alcohol withdrawal is symptom-triggered dosing of benzodiazepines using a withdrawal scale, most commonly, the 10-item Clinical Institute Withdrawal Assessment for alcohol, revised (CIWA-Ar) scale. Shorter and more objective scales are desirable. In 2016, the 5-item Brief Alcohol Withdrawal Scale (BAWS) and treatment protocol were developed and implemented at our institution.

**RESEARCH QUESTION OR HYPOTHESIS:** To evaluate the use, efficacy, and safety of the BAWS protocol among inpatients at The Johns Hopkins Hospital.

**STUDY DESIGN:** Single center, retrospective, observational, cohort study between August 2016 and July 2017.

**METHODS:** Benzodiazepine use, time on protocol, withdrawal severity, agitation, delirium, and over-sedation were assessed among patients on protocol. Comparisons were conducted between patients in medicine vs. surgical services, intensive care units (ICU) vs. non-ICUs, and severe withdrawal vs. non-severe withdrawal. Finally, the use of adjunctive treatments for symptom management was assessed.

**RESULTS:** 799 patients were included. Patients received a median (IQR) of 0 (0-4) lorazepam equivalents (LEs) while on protocol and were on the BAWS protocol for 44.9 (22.4-77.2) hours. Of the patients that received benzodiazepines while on the BAWS protocol, a median (IQR) of 4 (2-11) LEs were given. Seventeen (2.1%) patients had severe withdrawal. Days of agitation, delirium, and over-sedation were minimal, with the median (IQR) days of a RASS ≥ 2, CAM-ICU positive days, and RASS ≤ -2 of 0 (0-0). Few patients received adjunctive medications for symptom management. ICU patients had more severe withdrawal than non-ICU patients, but received the same cumulative benzodiazepine dose as non-ICU patients.

**CONCLUSION:** Most patients on the BAWS protocol received little to no benzodiazepines; severe withdrawal, agitation, delirium, or over-sedation were uncommon. These findings support the BAWS as a reasonable symptom-triggered alcohol withdrawal scale and protocol that can be used across a variety of patient populations.

**411. Inpatient management of individuals with active intravenous heroin abuse in a community teaching hospital** Diane Rudy, Pharm. D.[1], *Christine A. Hamby*, *Pharm.D.*[1], Nagesh Jadhav, MD[2]; [1]Department of Pharmacy, Rochester General Hospital, Rochester, NY [2]Department of Medicine, Rochester General Hospital, Rochester, NY

**INTRODUCTION:** Patients with active heroin abuse often experience withdrawal symptoms while hospitalized and may leave the hospital against medical advice (AMA). The objective of this quality improvement project was to determine which medications are utilized to manage withdrawal symptoms of patients while hospitalized.

**RESEARCH QUESTION OR HYPOTHESIS:** Are patients with heroin abuse managed with the most appropriate medications?

**STUDY DESIGN:** Retrospective

**METHODS:** This analysis was a single-center, retrospective chart review. Patients were identified with an ICD-10 report of individuals admitted with a history of substance abuse between January 2017 and July 2017. Patients selected for inclusion were at least 18 years of age, actively using IV heroin at the time of admission, and admitted for treatment of a medical illness other than opioid overdose. Exclusions were patients admitted to OB-GYN, observation, elective surgery, or psychiatry services, or who were treated with buprenorphine or methadone at the time of admission. Data was collected from electronic medical records and analyzed using descriptive statistics.

**RESULTS:** The most common medications used were short-acting opioids (73%), benzodiazepines (60%), anti-emetics (49%), and non-steroidal anti-inflammatory drugs (46%). Other less frequent medications were hydroxyzine (19%), trazodone (16%), gabapentin (11%), clonidine (8%), methadone (8%) and Suboxone (3%). The mean length of stay was 8 days; 22% of patients left AMA. The AMA rate was not statistically different depending on medications used. The 60-day readmission rate was 14% and was significantly lower when post-discharge substance abuse counseling was offered compared to not offered (4% vs. 68%, p=0.03). Illicit drug use during admission was confirmed for 15% of patients.

**CONCLUSION:** Illicit drug use during admission, AMA discharge, and readmission were common in this patient population. Short-acting opioids and benzodiazepines were frequently used during hospitalization, but these medications are not optimal for patients with active heroin abuse. This data underscores the need for education and awareness of treatment options.

**412. Predictors for hospital readmission for patients with opioid use disorder administered opioids during initial hospitalization** Jessica Moreno, Pharm.D.[1], *Matthew Duprey*, *Pharm.D.*[2], Sarah Wakeman, MD, FASAM[3], Russel Roberts, Pharm.D.[4], Jared Jacobson, BSc[5], John Devlin, Pharm.D.[6]; [1]Beaumont Health System, Royal Oak, MI [2]School of Pharmacy, Northeastern University, Boston, MA [3]Massachusetts General Hospital, Boston, MA [4]Massachusetts General Hosptal, Boston, MA [5]School of Health Sciences, Northeastern University, Boston, MA [6]Northeastern University School of Pharmacy, Boston, MA

**INTRODUCTION:** Patients with opioid use disorder (OUD) are increasingly admitted to acute care hospitals; the prevalence of 30- and 90-day hospital readmission in OUD patients and factors influencing hospital readmission are unknown.

**RESEARCH QUESTION OR HYPOTHESIS:** To identify the incidence, characteristics and predictors for 30- and 90-day readmission in patients with OUD administered ≥ 24 hours of opioids during hospitalization.

**STUDY DESIGN:** Prospective, cohort study

**METHODS:** This retrospective, cohort study evaluated consecutive adults admitted to an academic medical center with OUD admitted over a 5 year period (January, 2011 to December, 2016) and administered opioids ≥ 24 hours during admission. Pertinent admission, hospital and discharge variables were collected and compared between patients readmitted and not readmitted within 30- and 90-days after discharge and included in a multivariable logistic regression model if p <0.10.

**RESULTS:** Among the 470 adults [43.1 years, history of heroin use = 77.9%, admission opioid agonist therapy (OAT) use (buprenorphine

= 22.6%; methadone = 27.0%); medical (vs. surgical) = 75.3%, floor (vs. ICU) = 93.0%, mortality=0.9%], 85 (18.1%) and 151 (32.1%) were readmitted within 30- and 90-days, respectively. Among the 90-day readmitted patients, median time to first readmission was 26 days. Buprenorphine use (vs. no use) at index hospital admission was independently associated with reduced 30-day (OR=0.47; 95% CI, 0.24 to 0.93) and 90-day (OR=0.57; 95% CI, 0.34 to 0.96) readmission; prior heroin (vs. prescription opioid use) was associated with reduced 90-day readmission (OR=0.59; 95% CI, 0.37 to 0.94) and duration of hospital stay was associated with both greater 30-day (OR=1.02; 95% CI, 1.01 to 1.05) and 90-day (OR=1.02, 95% CI, 1.04 to 1.06) readmission.

**CONCLUSION:** Among patients with OUD taking buprenorphine at the time of hospital admission, 30-day and 90-day hospital readmission was reduced by 53% and 41%, respectively.

## TRANSPLANT/IMMUNOLOGY

**413. The impact of transplant pharmacists on length of stay and 30-day hospital readmission: a single-center retrospective cohort study**

Razan Alsheikh, Pharm.D., BCPS[1], *Katie Johnson, Pharm.D., BCPS*[2], Ashlee Dauenhauer, Pharm.D., BCPS[2], Pradeep Kadambi, MD, MBA, FASN, FAST[3]; [1]University of Arizona, Tucson, AZ [2]Banner University Medical Center, Tucson, AZ [3]University of Florida, Jacksonville, FL

**INTRODUCTION:** Transplant pharmacists have been recognized as an integral part of the transplant team in many governing and professional organizations. Little is known about the impact of transplant pharmacy services on the outcomes of transplant patients.

**RESEARCH QUESTION OR HYPOTHESIS:** Have the transplant pharmacy services provided in our center, according to the Centers of Medicare and Medicaid(CMS)expectations, affected the length of stay (LOS) after transplant surgery and all cause 30-day hospital readmission of kidney transplant patients?

**STUDY DESIGN:** A single-center retrospective cohort analysis.

**METHODS:** Data were collected in two phases. Phase I(pre-transplant pharmacist when there was no transplant pharmacist on service) included patients transplanted between October1$^{st}$,2015 and September30$^{th}$,2016. Phase II(post-transplant pharmacist)included patients transplanted between October1$^{st}$,2016 and September30$^{th}$,2017. Patients≥18 years; who received a kidney transplant in our center and had steroids, tacrolimus and mycophenolate for maintenance were included. Transplant pharmacy services provided followed the expectations of CMS for transplant centers. Primary outcomes were LOS after transplant surgery and all cause 30-day hospital readmission. Secondary outcomes included the number of discharge pharmacy notes and the achievement of therapeutic levels of tacrolimus at day 7 post-surgery. Unpaired t-test was used for continuous variables. Fisher exact test and Chi-square test were used for categorical data. Data analysis was performed using SPSS(IBM Corp.,version25.0)

**RESULTS:** The two groups (n=101 in phase I and n=104 in phase II) had similar demographics and transplant characteristics at baseline. LOS was shorter and the rate of 30-day hospital readmission was lower in phase II; however, both didn't reach a statistical significance (P=0.221,P=0.164;respectively).There was a significant difference in the number of discharge pharmacy notes(P=0.0001).There was no significant difference in tacrolimus level at day 7(mean 7.155 in phase I vs.6.959 ng/ml in phase II;P=0.673).

**CONCLUSION:** There was a trend of shorter hospital LOS and lower 30-day readmission rate in the post-transplant pharmacist cohort but it did not reach a statistical significance. The results can be further investigated in a larger randomized cohort.

**414. Clinical response to salvage bortezomib therapy for antibody mediated rejection and mixed acute rejection in a high immunologic risk renal transplant population**

*Hannah Underwood, Pharm.D.*[1], Alicia Lichvar, Pharm.D., MS[1], Jamie Benken, Pharm.D., BCPS[2], Zahraa Hajjiri, MD[3], Enrico Benedetti, MD[4]; [1]College of Pharmacy, University of Illinois at Chicago, Chicago, IL [2]Department of Pharmacy Practice, University of Illinois Hospital and Health Sciences System, Chicago, IL [3]University of Illinois Hospital and Health Sciences System, Chicago, IL [4]Department of Surgery, University of Illinois Hospital & Health Sciences System, Chicago, IL

**INTRODUCTION:** Bortezomib-containing regimens treat antibody mediated rejection (AMR) and mixed acute rejection (MAR) due to elimination of donor specific antibody (DSA). This agent is used in the setting of salvage therapy after traditional treatment modalities fail to achieve desired clinical responses. The long-term impact of this strategy is unknown.

**RESEARCH QUESTION OR HYPOTHESIS:** Salvage bortezomib-based therapy in high risk patients with AMR or MAR will result in a clinically significant decrease in serum creatinine and donor-specific antibody levels.

**STUDY DESIGN:** Single center, retrospective, cohort study

**METHODS:** High immunologic risk renal transplant (RTx) recipients experiencing AMR or MAR from 1/2008–09/2017 treated with a salvage bortezomib regimen were assessed. Salvage therapy was introduced when primary therapy (plasmapheresis/IVIG) was deemed ineffective by transplant team. The Banff Criteria was utilized to diagnose AMR and ACR. MAR was defined as having both ACR and AMR concurrently. The primary outcome was incidence of patients achieving a greater than 25% reduction in serum creatinine (SCr) 30 days post-bortezomib initiation.

**RESULTS:** A total of 12 RTx patients were analyzed and followed for a median of 474 (IQR 193 – 1723) days post-salvage bortezomib treatment. A majority of patients were female (58.3%) and African American (42%) with living-donor RTxs (83.3%). Pre-formed DSA occurred in 60% of recipients and 50% had positive flow cross-matches at the time of RTx. A majority of patients (58.3%) experienced a greater than 25% reduction in SCr, and 66.7% of patients experienced a greater than 50% reduction in immunodominant DSA. Four patients (33.3%) experienced graft loss 471 (IQR 227 – 1285) days post-salvage bortezomib therapy.

**CONCLUSION:** After introduction of bortezomib, there was a reduction in both SCr and DSA in a majority of patients. Salvage bortezomib

is a therapeutic option in refractory AMR and MAR in a high immunologic risk population as a part of a multi-modal treatment regimen.

**415. Development of de novo donor specific antibodies after antithymocyte globulin induction in kidney transplantation** *Oxana Megherea, Pharm.D.*[1], Yohanka Elise Caro, Pharm.D. Candidate 2019[1], Nicole Sifontis, Pharm.D., FCCP, BCPS[2], Adam Diamond, Pharm.D., BCPS[3]; [1]Temple University School of Pharmacy, Philadelphia, PA [2]Department of Pharmacy Practice, Temple University School of Pharmacy, Philadelphia, PA [3]Temple University Health System, Philadelphia, PA

**INTRODUCTION:** Advances in immunosuppressive therapies have considerably improved the incidence of one year graft and patient survival in solid organ transplantation. However, the development of *de novo* donor specific antibodies (dnDSAs) has been associated with antibody mediated rejection and worse long-term graft outcomes. Identification of risk factors for developing dnDSAs may help to preserve graft function and improve long-term outcomes.

**RESEARCH QUESTION OR HYPOTHESIS:** Determine the clinical significance of dnDSAs in kidney transplant (KT) patients who received rATG induction.

**STUDY DESIGN:** Retrospective chart review.

**METHODS:** 135 patients received a KT at our institution between Jan 2014 and June 2016. Sixty eight met inclusion criteria. Primary outcome was the incidence of dnDSAs at 12 months. Secondary outcomes included dnDSA classification, time to development of dnDSAs, and the incidence of graft and patient survival at 12 months.

**RESULTS:** Development of dnDSAs occurred in 22% of patients with a median time to dnDSA development of 56 days. HLA-A, B, DR, DQ and DP was 1.5%, 1.5%, 7.4%, 13.2%, and 1.5%, respectively. A higher rate of rejection was identified in those that developed dnDSA (Table 1). Multivariate analysis did not identify any independent predictors for the development of dnDSA.

**Table 1**

| | No dnDSA (N=53) | dnDSA (N= 15) | p-value |
|---|---|---|---|
| Recipient age at transplant (years), median ± SD | 55.92 ± 12.28 | 53.47 ± 11.68 | NS |
| African American ethnicity, n (%) | 30 (56.6) | 10 (66.7) | NS |
| Deceased donor, n (%) | 49 (92.5) | 14 (93.3) | NS |
| Steroid Use > 1 month | 30 (56.6) | 12 (80) | NS |
| Total Thymoglobulin dose (mg/kg), median | 4 | 5 | **0.042** |
| Biopsy-proven acute rejection, n (%) | 3 (5.8) | 4 (26.7) | **0.04** |

**CONCLUSION:** Our findings suggest that higher rates of rejection were observed in those patients who developed dnDSAs. The most common type of DSA developed was HLA DQ antibodies. Follow-up continues to determine independent predictors for the development of dnDSA in this cohort.

**416E. Evaluation of renal and bone safety in post liver transplant patients with chronic kidney disease receiving Tenofovir Alafenamide for HBV prophylaxis** Edward Gane, MD[1], George Bibin, MD[2], Stephen Munn, MD[3], John Flaherty, Pharm.D.[4], *EunYoung Lee, Pharm. D.*[5], Suri Vithika, NA[4], Hongyuan Wang, NA[4], Anuj Gaggar, MD[4]; [1]School of Medicine, The university of Auckland, Auckland, New Zealand [2]NZLTU, Auckland City Hospital,, Auckland, New Zealand [3]New Zealand Liver Transplant Unit (NZLTU), Auckland, New Zealand [4]Gilead Sciences, Foster City, CA [5]Gilead Science, Foster City, CA
Published in Journal of Hepatology 2018; 1(68):s87.

**417. Changing trends in first transplant pharmacist jobs** Barrett Crowther, Pharm.D., BCPS[1], *Christina Doligalski, Pharm.D.*[2], Nicole Alvey, Pharm.D.[3], Karen Khalil, Pharm.D.[4], Erik Henricksen, Pharm.D.[5], James Fleming, Pharm.D.[6]; [1]University Health System, San Antonio, TX [2]Department of Pharmacy, University of North Carolina Health, Chapel Hill, NC [3]Rush University Hospital, Chicago, IL [4]College of Pharmacy, University of Illinois Hospital & Health Sciences System, Chicago, IL [5]University of California, San Francisco, San Francisco, CA [6]Department of Pharmacy Services, Medical University of South Carolina, Charleston, SC

**INTRODUCTION:** Training programs for transplant (SOT) pharmacy have increased by 7-fold over 10 years. We sought to evaluate the changing job market in order to maximize trainee competitiveness.

**RESEARCH QUESTION OR HYPOTHESIS:** How has the job market changed for SOT pharmacists entering the workforce?

**STUDY DESIGN:** This was a cross-sectional analysis of a survey developed through an iterative process assessing pharmacists' first job related to SOT.

**METHODS:** The survey was IRB approved and sent via email to members of two transplant pharmacist societies and was recorded via REDCap. We analyzed all data using standard descriptive statistic methodologies using Microsoft Excel and SPSS v24.0.

**RESULTS:** We received 218 unique responses, with the year of first job ranging from 1986 to 2018. Most (122/218 (56%)) of the first jobs reported were in the past 5 years (2013+). Of jobs taken since 2013, 71% had completed a PGY2 in SOT, compared to 52% who took jobs pre-2013. More recent jobs also had more respondents with non-SOT PGY2 training (9 vs 5%). Since 2013, pharmacists were less likely to have a PGY1 as their highest level of formal training (11 vs 32%), but had more positions taken from pharmacists with no post-doctoral training (5 vs 3%). Since 2013, positions taken differed from the earlier era in the following ways: more with an ambulatory component (81% vs 59%), more to include coverage of cardiothoracic transplants (45 vs 29%), and more had medication order entry as a job responsibility (65 vs 47%). Pre-2013, 79% of jobs were service-based and 14% of jobs were floor-based, compared to 90% and 8%, respectively since 2013.

**CONCLUSION:** We present descriptive results of a survey and identify some evolving trends in SOT pharmacist jobs. Continuing to assess these trends will help us identify changes needed in

educational curriculums to best prepare learners for the field's growing needs.

**418. Lung transplant after cystic fibrosis in the face of multidrug resistant organisms** Ryan Winstead, Pharm.D.[1], *Rickey Evans, Pharm. D., BCPS*[2], Georgina Waldman, Pharm.D.[3], Elizabeth Autry, Pharm.D.[1], Aric Schadler, MS[4], Lindsey Kays, Pharm.D. Candidate[4], Maher Baz, MD[1], Michael Anstead, MD[1], Alexis Shafii, MD[1], Megan Goetz, Pharm.D.[5]; [1]University of Kentucky Healthcare, Lexington, KY [2]University of South Carolina College of Pharmacy, Columbia, SC [3]University of California San Diego Health, San Diego, CA [4]University of Kentucky College of Pharmacy, Lexington, KY [5]The Ohio State University Wexner Medical Center, Columbus, OH

**INTRODUCTION:** Since the largest study on multi-drug resistant organisms (MDRO) and lung transplantation of cystic fibrosis (CF) patients, there have been innovations and advancements in the treatment of *Pseudomonas spp*. The 2007 study by Hadjiliadis and colleagues showed that patients harboring pan-resistant *Pseudomonas* had worse survival after lung transplant. The objective of this study is to assess clinical outcomes in the setting of new antimicrobial treatment options and strategies.

**RESEARCH QUESTION OR HYPOTHESIS:** There will be no difference in clinical outcomes of CF patients with a history of MDRO infections who undergo lung transplantation despite treatment advances with antimicrobial therapy.

**STUDY DESIGN:** Multi-center, retrospective, cohort study conducted in CF patients chronically infected with MDROs who received a lung transplant from January 2008 through August 2016.

**METHODS:** Patients in the less susceptible cohort (n=25) were either chronically infected with pan-resistant *Pseudomonas*, polymyxin-sensitive only, or sensitive to two classes (polymyxin plus one other); all remaining patients (n=19) with more susceptible *Pseudomonas* or no *Pseudomonas* remained in the control cohort. The primary outcome is a composite of patient survival, retransplantation, chronic lung allograft dysfunction (CLAD), and acute rejection at 12 months post-transplant. Categorical variables were analyzed using the Chi-square test. The independent samples t-test was utilized for continuous variables.

**RESULTS:** There was no significant difference in the primary outcome [40% vs 37%, p=0.831]. Differences between patient survival [84% vs 95%, p=0.487], the incidence of acute rejection [20% vs 33%, p=0.323], and the incidence of CLAD [12% vs 5%, p=0.441] were not statistically significant between groups. No patients underwent retransplantation. Polymyxins and high-dose-extended-interval aminoglycosides were the most common novel treatment strategies for pneumonia followed by extended-infusion beta-lactams.

**CONCLUSION:** There were no significant differences between the two cohorts when analyzing the primary composite outcome and its individual components. Future directions include expanding to additional study sites and analyzing outcomes based upon choice of treatment.

**419. Tacrolimus concentration-to-dose ratios in kidney transplant recipients and relationship to outcomes** Felicia Bartlett, Pharm.D.[1], *Clarice Carthon, Pharm.D., BCPS*[2], Jennifer Hagopian, Pharm.D., BCPS[1], Spenser January, Pharm.D.[2], Timothy Horwedel, Pharm.D., BCPS[1]; [1]Barnes-Jewish Hospital, Saint Louis, MO [2]Department of Pharmacy, Barnes-Jewish Hospital, Saint Louis, MO

**INTRODUCTION:** Tacrolimus, the calcineurin inhibitor of choice in kidney transplantation, requires regular trough level monitoring for determination of efficacy and safety. A developing subset of literature has utilized tacrolimus concentration-to-dose (C/D) ratios as a surrogate for tacrolimus metabolism; where low C/D ratios correlate with higher metabolism. Questions remain as to whether C/D ratios are possibly better indicators of tacrolimus exposure and therefore better predictor of clinical outcomes.

**RESEARCH QUESTION OR HYPOTHESIS:** Patients with low C/D ratios will have higher BPAR rates, inferior graft function and survival compared to those with high C/D ratios.

**STUDY DESIGN:** Single-center, retrospective chart review

**METHODS:** Adults who received a kidney transplant from January 2006 to August 2016 were evaluated for inclusion. Patients were included if they received anti-thymocyte globulin induction and had a maintenance regimen consisting of tacrolimus immediate release, mycophenolate and prednisone.The primary endpoint evaluated was BPAR at 1 year.

**RESULTS:** 1254 kidney transplant recipients met inclusion criteria; 322 patients in Cluster 1 (high C/D ratio) with a mean C/D of 2.91, and 932 patients in Cluster 2 (low C/D ratio) with a mean C/D of 1.14. The average age in Cluster 2 was 50.5 years compared to 54.3 years in Cluster 1 ($p<0.01$). Of the entire African American population in this study, 92.7% were in Cluster 2. There was a statistically significant difference at all time points in tacrolimus doses required to achieve a therapeutic trough. BPAR 1 year post-transplant was not statistically significant between Cluster 1 and Cluster 2 ( 3.7% vs 3.6% [p=0.95]). Graft loss at 1 year, 3 years and 5 years post-transplant was not found to be statistically significant. Rates of CMV and BK viruses were not statistically significant between the two groups at any time point.

**CONCLUSION:** Our data was unable to correlate C/D ratios to a difference in clinical outcomes post-transplant.

**420. Erythropoiesis stimulating agents post-renal transplantation: hemoglobin response and adverse events** *Calvin Meaney, Pharm.D., BCPS*[1], HaYoung Ryu, Pharm.D.[2], Yen Ngo, Pharm.D.[2], Ashley Pulka, Pharm.D.[3]; [1]Department of Pharmacy Practice, University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY [2]University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY [3]Erie County Medical Center, Buffalo, NY

**INTRODUCTION:** Use of erythropoiesis stimulating agents (ESA) after renal transplantation is complicated by variable hemoglobin response, immunomodulatory effects, and unknown risk of serious adverse events in this vulnerable population.

**RESEARCH QUESTION OR HYPOTHESIS:** What are the hemoglobin response and major ESA related adverse events in renal transplant recipients?

**STUDY DESIGN:** Retrospective, single-center, matched case-control study

**METHODS:** Cases of ESA use were matched 1:2 with controls (no ESA use) based on age, gender, and transplant date. Patients were ≥18 years old, at least 4 months post-transplant, and treated with similar immunosuppressive protocol. Hemoglobin response was evaluated using time within therapeutic range (TTR) of 10-11g/dL and number of blood transfusions. All-cause mortality, hypertension, cardiovascular and thromboembolic events were assessed. Statistical analysis with appropriate hypothesis testing was completed with SAS v9.4 with alpha=0.05.

**RESULTS:** 90 patients (30 cases and 60 controls) were followed for 42.6±34.1 months. Demographics were age 56.3±9.0 years, 57% female, and 23.7±22.9 months post-transplant. Baseline estimated glomerular filtration rate was 52.5±16.5ml/min/1.73m$^2$ for cases compared to 78.3±15.3ml/min/1.73m$^2$ for controls (P<0.001). Type of ESA used was epoetin alfa (53%), darbepoetin alfa (40%), and both agents (7%). TTR was assessed with 2,042 hemoglobin observations in cases, of which 23% were within the therapeutic range of 10-11g/dL, 52% were below target, and 25% were above. Secondary endpoints are shown in the table.

| | Cases (n=30) | Controls (n=60) | P-value |
|---|---|---|---|
| Blood Transfusion | 53% | 1.7% | <0.001 |
| Cardiovascular event | 16.7% | 0% | <0.001 |
| Thromboembolic event | 13% | 1.7% | <0.001 |
| Number of antihypertensive medications | Median 4 (IQR 2-4) | Median 2 (IQR 1-3) | <0.001 |
| All-cause mortality | 16.7% | 0% | <0.001 |

**CONCLUSION:** Response to ESAs post renal-transplantation is poor with low time in therapeutic range and frequent blood transfusions. Serious adverse events occur with ESA use. These findings are confounded by lower baseline renal function in the cases and therefore require confirmation. Guidelines for the use of ESA post renal-transplant are needed.

**421. Immunologic outcomes of erythropoiesis stimulating agents in renal transplant recipients** *Calvin Meaney, Pharm.D., BCPS*[1], Yen Ngo, Pharm.D.[2], HaYoung Ryu, Pharm.D.[2], Ashley Pulka, Pharm.D.[3]; [1]Department of Pharmacy Practice, University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY [2]University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY [3]Erie County Medical Center, Buffalo, NY

**INTRODUCTION:** Erythropoietin has been shown to inhibit allogeneic CD4 T cell proliferation and stimulate regulatory T cell differentiation in vitro. The clinical effects of these immunomodulatory properties are unknown in the renal transplant population.

**RESEARCH QUESTION OR HYPOTHESIS:** Does exogenous administration of recombinant human erythropoietin affect immune outcomes following renal transplantation?

**STUDY DESIGN:** Retrospective, single-center, matched case-control study

**METHODS:** Cases of erythropoiesis stimulating agent (ESA) use were matched 1:2 with controls (no ESA use) based on age, gender, and transplant date. Patients were ≥18 years old, at least 4 months post-transplant, and treated with similar immunosuppressive protocol. Allograft function over time was assessed with percentage change in estimated glomerular filtration rate (eGFR) using Nankivell's equation. Immunologic transplant outcomes included acute rejection, allograft loss, infection, and mortality. Statistical analysis included appropriate hypothesis testing and logistic regression using SAS v9.4 with alpha=0.05.

**RESULTS:** The study included 90 renal transplant recipients followed for 42.6±34.1 months, of which 30 received ESA. Patients were 56.3±9.0 years old, 57% female, and 23.7±22.9 months post-transplant. Baseline eGFR was 52.5±16.5ml/min/1.73m$^2$ for cases compared to 78.3±15.3ml/min/1.73m$^2$ for controls (P<0.001). Change in allograft function over the study period was -21±29% for cases compared to -0.1±22% for controls (mean difference -21%, 95% confidence interval -10% to -32%, P<0.001). Immunologic outcomes are shown in the table.

| | Cases (n=30) | Controls (n=60) | Odds ratio (95% CI) | P-value |
|---|---|---|---|---|
| Acute Rejection | 8 (26.7%) | 4 (6.7%) | 5.1 (1.4-18.6) | 0.014 |
| Graft failure | 10 (33.3%) | 1 (1.7%) | 29.4 (3.5-250) | <0.001 |
| Infection | 24 (80%) | 37 (61.7%) | 2.5 (0.88-7.0) | 0.085 |
| All-cause mortality | 5 (16.7%) | 0 (0%) | NA | <0.001 |

**CONCLUSION:** Allograft function declines more rapidly among ESA users than controls with more frequent acute rejection and graft failure. ESAs should be used cautiously post-renal transplant given these poor outcomes. These results may be biased due to lower baseline renal function among ESA users, although that is inherent to the drugs indication.

**422. Effect of immunization on pre-transplant allosensitization** *Kate Berlin, BS*[1], Gregory Press, BS[2], Thomas Ellis, Ph.D.[3], Mary Hayney, Pharm.D., MPH[4]; [1]University of Wisconsin – Madison School of Pharmacy, Madison, WI [2]University of Wisconsin Hospital and Clinics, Madison, WI [3]University of Wisconsin – Madison, Madison, WI [4]School of Pharmacy and School of Medicine and Public Health, University of Wisconsin-Madison, Madison, WI

**INTRODUCTION:** Efforts are made to fully immunize patients waiting for solid organ transplantation to protect them from vaccine-

preventable diseases prior to initiating immunosuppressing therapy. Blood transfusions and pregnancy are known allosensitizing events. However, some have observed that immunization may confer a risk of allosensitization in predisposed individuals.

**RESEARCH QUESTION OR HYPOTHESIS:** Does immunization cause an increase in calculated panel reactive antibody (CPRA) values in individuals awaiting solid organ transplant?

**STUDY DESIGN:** Single center, prospective study.

**METHODS:** Serial serum samples were obtained for HLA antibody analysis by the UW Clinical Laboratory. Adults waiting for kidney, pancreas, or simultaneous kidney/pancreas transplant who had CPRA measured between 3/1/2017 and 6/30/2017 and between 10/1/2017 and 12/31/2017 (n=179) were included. Individuals who had received a solid organ transplant or blood transfusion during this time were excluded. Immunization history was gathered from the Wisconsin Immunization Registry (WIR) or electronic medical record. Statistical analyses were performed for paired CPRA values. A change cPRA was noted if increased by 10% points; *e.g. 10% to 20%*.

**RESULTS:** ±12 years; 91 individuals received at least one immunization (86 influenza, 20 HepB, 2 Tdap, 6 PCV13, 8 PPSV23). A change in CPRA of 10% was noted in 1.7% (n=3; 2 received immunization; p=1.0 Fisher's Exact).

**CONCLUSION:** Only 1.1% of study participants (n=2) had significant increase in CPRA values following immunization. This suggests routine immunization is a safe practice for patients awaiting organ transplant, despite past theories of increased risk of allosensitization.

**423. Azathioprine is comparable to mycophenolate in prevention of rejection after kidney transplantation** *Jennifer Hagopian, Pharm.D., BCPS*, Timothy Horwedel, Pharm.D., BCPS and Clarice Carthon, Pharm.D., BCPS; Barnes-Jewish Hospital, St. Louis, MO

**INTRODUCTION:** Use of maintenance immunosuppression after kidney transplantation has evolved over time and commonly consists of a combination of a calcineurin inhibitor, antimetabolite, and corticosteroids. Debate over choice of antimetabolite often favors mycophenolate over azathioprine in high risk patients, yet azathioprine offers benefits of once-daily administration and availability of inexpensive generic formulations. The Kidney Transplant Center at Barnes-Jewish Hospital preferentially uses azathioprine in patients with GI intolerance to mycophenolate or in women of child bearing age regardless of rejection risk.

**RESEARCH QUESTION OR HYPOTHESIS:** Our research aims to show similar rates of rejection between patients using azathioprine (AZA) or mycophenolate (MPA) as part of a triple-maintenance immunosuppression regimen.

**STUDY DESIGN:** Kidney transplant recipients who received a kidney transplant from January 1, 1999 to present were evaluated for inclusion. Patients were included if they received anti-thymocyte globulin induction and had a maintenance regimen consisting of tacrolimus, prednisone and either AZA or MPA.

**METHODS:** Patients were separated into two groups based on the use of AZA or MPA at 1-month post-transplant. The primary endpoint evaluated was risk of acute cellular rejection.

**RESULTS:** In total, 2388 kidney transplant recipients were included in the analysis. Of those, 261 patients received AZA compared to 2127 MPA treated patients. AZA treated patients were on average 49 years old at the time of transplant, 48.7% (n=127) were female and 20.3% (n=53) were Black. Rates of pretransplant diabetes, coronary artery disease, and hypertension were not different between groups. The primary endpoint of risk of acute cellular rejection was not different in azathioprine versus mycophenolate treated patients (HR 0.914, p=0.700). Risk of rejection was increased in Black patients (HR 1.73, p<0.001) and decreased in older recipients (HR 0.966, p<0.001). **Conclusion**: Our data supports the use of azathioprine as an alternative or primary antimetabolite of choice after kidney transplantation.

**424. Urinary tract infections in kidney transplant recipients: incidence and susceptibility patterns** Terry Pak, Pharm.D.[1], *Michael Wynd, Pharm.D.*[2]; [1]Department of Pharmacy, Memorial Sloan-Kettering Cancer Center, New York, NY [2]Department of Pharmacy Practice and Administration, Rutgers, The State University of New Jersey, Piscataway, NJ

**INTRODUCTION:** Urinary tract infections (UTIs) are the most common bacterial infection in kidney transplant recipients (KTRs) within the first year post-transplant occurring in 30 – 35% of KTRs. Management of UTIs in KTRs is challenging due to their immunocompromised status, possibility of drug-resistant pathogens, and exposure to routine post-operative antimicrobial prophylaxis.

**RESEARCH QUESTION OR HYPOTHESIS:** Identify the incidence of UTIs in KTRs within the first year after transplant and describe the susceptibility patterns observed.

**STUDY DESIGN:** Retrospective chart review.

**METHODS:** The electronic medical record was used to identify patients who received a kidney transplant between May 2013 and April 2016. Adult KTRs who developed a UTI within the first year post-transplant were included. Data collected: patient demographics, laboratory data, history of UTI and bladder dysregulation prior to transplant, native kidney disease, immunosuppression (induction and maintenance), duration of indwelling urinary catheter, presence of ureteral stent, date of UTI post-transplant, susceptibility pattern of isolated organisms, antimicrobial prophylaxis, empiric/definitive antimicrobial treatment and duration, occurrence of delayed graft function and patient and allograft outcomes. Data was analyzed by descriptive statistics.

**RESULTS:** Fifty patients received a kidney transplant during the designated time period. Three patients were excluded (2 pediatric recipients, 1 patient with insufficient data). Fifteen of 47 (32%) adult KTRs had at least one UTI episode. The most common pathogens isolated were *Escherichia coli* (36%), *Klebsiella pneumoniae* (14%), and *Pseudomonas aeruginosa* (11%). Susceptibility amongst the three most common pathogens: piperacillin/tazobactam 79%, nitrofurantoin 62%, ciprofloxacin 57%, ampicillin 24%, and sulfamethoxazole/

trimethoprim 7%. Multidrug-resistant organisms: extended-spectrum beta-lactamase producing *E. coli* 0.5%, carbapenem-resistant Enterobacteriaceae 0%.

**CONCLUSION:** Incidence of UTIs in KTRs within the first year post-transplant was consistent with published literature. Local susceptibility patterns and patient characteristics will help guide empiric antibiotic selection in this patient population.

**425E. Time within therapeutic range: a comparison of three tacrolimus formulations in renal transplant recipients** Karen Khalil, Pharm. D.[1], Patricia West-Thielke, Pharm.D.[2], *Alicia Lichvar, Pharm.D., MS*[3], Enrico Benedetti, MD[2], Shree Patel, Pharm.D.[1]; [1]College of Pharmacy, University of Illinois Hospital & Health Sciences System, Chicago, IL [2]Department of Surgery, University of Illinois Hospital & Health Sciences System, Chicago, IL [3]College of Pharmacy, University of Illinois at Chicago, Chicago, IL

Presented at American Transplant Congress held by the American Society of Transplantation in Seattle, WA, June 4, 2018.

**426. Obesity does not impact emergency department utilization and hospital admissions in an adult urban renal transplant population** Alisha Patel, Pharm.D.[1], *Alicia Lichvar, Pharm.D., MS*[1], Renee Petzel Gimbar, Pharm.D.[1], Maya Campara, Pharm.D., BCPS[2]; [1]Department of Pharmacy Practice, University of Illinois at Chicago College of Pharmacy, Chicago, IL [2]College of Pharmacy, University of Illinois at Chicago, Chicago, IL

**INTRODUCTION:** The prevalence of obesity within end stage renal disease (ESRD) patients awaiting renal transplantation (RTx) is increasing. Obesity is considered a relative contraindication to RTx at many institutions due to post-operative complications. The University of Illinois Hospital and Health Sciences System performs RTxs in obese patients with a BMI cutoff of 60 kg/m$^2$. Emergency department (ED) visits and hospitalizations are manifestations of these complications.

**RESEARCH QUESTION OR HYPOTHESIS:** Does obesity impact ED visits and hospitalizations within the first 12 months post-RTx?

**STUDY DESIGN:** Single-center, retrospective study

**METHODS:** RTx recipients from 09/20/13to 09/19/16 were included. Patients were followed for 12 months from date of RTx. Obesity was defined as having a BMI>30 kg/m$^2$. Demographics, complications requiring ED or hospital intervention, and laboratory values were collected for comparison.

**RESULTS:** 198 RTx recipients were included (obese RTx [ORTx] = 111; non-obese RTx [NORTx] = 87). Patients were 50.8 years of age, 63.1% male, 46.9% African American, and living-donor RTx (61.6%). Average BMI was 33.3±9.7 kg/m$^2$. Of ORTx, 84/111 (75.7%) received robotic RTx. Incidence of ED visits (NORTx 54% vs. 44%, p=0.17) and hospitalizations (NORTx 58.6% vs. 57.7%, p=0.89) were similar. Average number of ED visits (p=0.62) and hospitalizations (p=0.25) was not different between groups. Time to first ED visit post-RTx differed (NORTx 139.5 days vs ORTx 79.3 days, p=0.007). There was a trend towards higher rejection rates in ORTx (NORTx 10.3% vs. ORTx 19.8%, p=0.06), driven by empiric rejection treatment (53.3%). Higher eGFRs were observed in NORTx compared to ORTx patients at 1, 3, and 6 months post-RTx (p>0.05); eGFR was similar between groups 12 months post-RTx (p=0.17).

**CONCLUSION:** Complications requiring ED or hospital intervention between obese and non-obese patients were similar. A more detailed analysis of healthcare cost comparisons should be performed to assess differences in this niche population.

**427. Evaluation of high- versus low-dose valganciclovir for cytomegalovirus disease prevention in liver transplant recipients** *Parth Parikh, Pharm.D.*; Department of Pharmacy Services, VCU Health, Richmond, VA

**INTRODUCTION:** Valganciclovir 900 mg daily is the current drug regimen of choice for prophylaxis against cytomegalovirus (CMV) disease in solid organ transplant recipients. However, this dose is associated with significant bone marrow suppression. A lower dose of valganciclovir 450 mg daily has shown similar efficacy in preventing CMV disease in renal transplant recipients. However, there is a paucity of literature to substantiate the efficacy and safety of low-dose valganciclovir for CMV disease prophylaxis in liver transplant recipients (LTR).

**RESEARCH QUESTION OR HYPOTHESIS:** Is low-dose (450mg daily) valganciclovir as effective and safe for CMV disease prevention in liver transplant recipients as high-dose (900 mg daily) valganciclovir?

**STUDY DESIGN:** Single-center retrospective chart review.

**METHODS:** Consecutive high and intermediate CMV risk LTRs from June 1, 2012 to July 1, 2017 were assessed for inclusion in the study. The primary endpoint was the incidence of CMV infection and/or disease within 12 months after liver transplantation. Secondary outcomes included incidence of breakthrough CMV infection and/or disease, biopsy confirmed tissue invasive disease, premature valganciclovir discontinuation, and incidence of leukopenia.

**RESULTS:** Ninety-one high and intermediate risk LTR (high-dose, n = 58; low-dose, n = 33) were included. CMV infection and/or disease occurred in 13.8% and 9% (p = 0.302) in the high-dose and low-dose groups respectively. More patients in the low-dose group experienced breakthrough CMV infection and/or disease, however this was not statistically significant. There was no difference in the rates of biopsy confirmed tissue invasive disease, premature valganciclovir discontinuation or leukopenia between the two groups. Patient and graft survival outcomes were also similar between groups.

**CONCLUSION:** The incidence rates of CMV infection between the high- and low-dose valganciclovir groups were similar, suggesting that low-dose valganciclovir is comparable to high-dose valganciclovir when used for CMV disease prophylaxis in high and intermediate CMV risk LTR.

**428. Rabbit anti-thymocyte globulin dosing strategies in renal transplant recipients** *Kent Botkin, Pharm.D.*[1], Clarice Carthon, Pharm.D., BCPS[2], Timothy Horwedel, Pharm.D., BCPS[2], Jennifer Hagopian, Pharm.D., BCPS[2], April Pottebaum, Pharm.D.[1], Andrew Malone, MB

BCh[3]; [1]Department of Pharmacy, Barnes-Jewish Hospital, Saint Louis, MO [2]Barnes-Jewish Hospital, St. Louis, MO [3]Department of Nephrology, Washington University in Saint Louis School of Medicine, Saint Louis, MO

**INTRODUCTION:** Rabbit anti-thymocyte globulin (rATG) induction is commonly used in renal transplantation (rTXP), however, optimal dosing is unknown.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the optimal dosing of rATG induction based on pre-transplant rejection risk?

**STUDY DESIGN:** Single-center, retrospective, comparative cohort analysis conducted at Barnes-Jewish Hospital.

**METHODS:** All adult rTXP from 1998 to 2017 who received rATG induction were evaluated. Excluded were patients that received: multi-organ transplants, non-standard maintenance immunosuppression (tacrolimus, mycophenolic acid, and prednisone), doses of rATG outside pre-defined ranges, or experienced graft loss or death within 96 hours of transplant. Patients were high-risk if met ≥ 1 of the following: cPRA ≥30%, positive flow or CDC cross match, <40 years old, black, 2 DR mismatches, prior transplant, or positive DSA. Low-risk was defined as the absence of high-risk characteristics. Comparisons were made between 5 mg/kg and 6 mg/kg within the high-risk group and between 3 mg/kg and 5 mg/kg in the low-risk group. The primary outcome was a six month composite of biopsy proven acute rejection (BPAR), patient survival and graft loss. Additional outcomes included rejection severity, cytomegalovirus viremia, and new malignancy.

**RESULTS:** 1848 rTXP were included for analysis. Baseline demographic did not clinically differ between groups. There was no difference in the primary outcome in the high-risk group when comparing 5 mg/kg vs 6 mg/kg (5.2 % vs 4.3 %; P=0.565). The low-risk groups showed a significant increase in the primary outcome comparing 3 mg/kg vs 5 mg/kg (10.0 % vs. 2.2 %; P=0.022); driven by an increase in BPAR in the 3 mg/kg group (10.0 % vs 1.4%; P=0.007). Secondary outcomes were similar between groups.

**CONCLUSION:** 5 mg/kg dosing of rATG seems to provide optimization in the composite of BPAR, patient survival, and graft loss regardless of defined rejection risk. Further study is warranted.

## WOMEN'S HEALTH

**429. Oral emergency contraception availability: a comparison between chain and independent retail pharmacies in georgia** *Stella Hur, Pharm.D. Candidate*[1], Brielle Scutt, Pharm.D. Candidate[1], Dennia Ernest, Pharm.D. Candidate[1], Sally Rafie, Pharm.D., BCPS[2], Rebecca Stone, Pharm.D., BCACP, BCPS[3]; [1]College of Pharmacy, University of Georgia, Athens, GA [2]University of California, San Diego Skaggs School of Pharmacy and Pharmaceutical Sciences, La Jolla, CA [3]Department of Clinical and Administrative Pharmacy, University of Georgia College of Pharmacy, Athens, GA

**INTRODUCTION:** Emergency contraception (EC) efficacy is highly dependent on timing of administration, therefore accurate pharmacy stock information is important to ensure timely access.

**RESEARCH QUESTION OR HYPOTHESIS:** Comparing chain (C) and independent (I) retail pharmacies in Georgia, are there differences in pharmacist reported oral EC stock availability and stock discrepancy?

**STUDY DESIGN:** Prospective, randomized, telephone-based survey

**METHODS:** A list of Georgia retail pharmacies was obtained; 25% were randomly selected, stratified across NCHS rural-urban code. Pharmacies were called to assess pharmacist reported stock status of levonorgestrel (LNG) and ulipristal acetate (UPA) EC. Researchers called as a mystery patient, and a subsequent call 21+ days later as a researcher. Analysis utilized descriptive statistics and Chi Square.

**RESULTS:** Of the 600 randomly selected pharmacies, 330 (63% C vs. 37% I) participated in both calls. 190 (56%) pharmacies reported LNG EC in stock, 10 (3%) reported UPA EC in stock. Chain pharmacies were more likely to have LNG EC (80.4% C vs 18.1% I, p<0.001), no difference for UPA EC (4.3% C vs 1.7% I, p=0.34). Stock discrepancy, when discordant availability was reported to mystery patient vs. researcher, was identified in 42 pharmacies (13%). Chain pharmacies had a higher incidence of reported stock discrepancy (18.1% C vs 7.4% I, p=0.007).

**CONCLUSION:** Women in Georgia face barriers accessing time sensitive oral EC medications. 42% of pharmacies did not have oral EC stocked, 13% had reported stock discrepancy between 2 callers. Independent pharmacies were less likely to stock oral EC, but more likely to provide accurate stock information.

**430. Pharmacokinetics of the coadministration of bremelanotide and metformin: a phase 1, randomized, double-blind, placebo-controlled trial** *Luana Pesco Koplowitz, MD, Ph.D.*[1], Barry Koplowitz, MS[1], Robert Jordan, BS[2], Johna Lucas, MD, MA, FACOG[2]; [1]DUCK FLATS Pharma, Elbridge, NY [2]Palatin Technologies, Inc., Cranbury, NJ

**INTRODUCTION:** Bremelanotide is a melanocortin-4-receptor agonist that is being investigated for the treatment of hypoactive sexual desire disorder (HSDD) in premenopausal women. Diabetes mellitus, which is frequently treated with metformin, occurs in 11.8% of women with HSDD (Shifren et al, 2008).

**RESEARCH QUESTION OR HYPOTHESIS:** The purpose of this study was to evaluate the safety, tolerability, pharmacokinetics (PK), and pharmacodynamics of bremelanotide when administered concomitantly with metformin.

**STUDY DESIGN:** A phase 1, single-center, randomized, 2-way crossover, double-blind, placebo-controlled, drug-drug interaction study was conducted in healthy subjects aged 18 to 55 years. Metformin (500mg BID) alone was orally administered during the open-label phase. A single subcutaneous injection of 1.75mg bremelanotide or placebo was coadministered with metformin during the double-blind phase.

**METHODS:** Metformin PK parameters included $t_{max}$, $C_{max}$, and $AUC_{\tau}$ – all after coadministration with bremelanotide or placebo. Bremelanotide PK parameters included $t_{max}$, $C_{max}$, and $AUC_{0-\infty}$. Mean changes in blood glucose concentration ($CG_{avg}$) were measured after metformin coadministration. Adverse events (AEs) were also monitored.

**RESULTS:** Seventeen females and 19 males completed this study. Concomitant administration with bremelanotide decreased metformin $C_{max}$ and $AUC_{\tau}$ by approximately 18% and 8%, respectively; the decrease in $C_{max}$ was statistically significant. However, differences in mean changes from baseline $CG_{avg}$ between the bremelanotide and placebo groups were not statistically significant. Median metformin $t_{max}$ was 4 hours for both treatments. Median bremelanotide $C_{max}$ and $AUC_{0-\infty}$ were 67 ng/mL and 229 ng*h/mL, respectively, and median bremelanotide $t_{max}$ occurred 1 hour after coadministration with metformin. Among subjects who received bremelanotide, 67% experienced AEs vs 28% who received placebo. The most common AEs were nausea, flushing, and headache, which is consistent with the known safety profile of bremelanotide.

**CONCLUSION:** There was not a clinically significant PK interaction between metformin and bremelanotide, and concomitant administration did not appear to affect the safety profile of either drug.

**431. Pharmacokinetics of the coadministration of bremelanotide and norethindrone/ethinyl estradiol oral contraceptives: a phase 1, randomized, double-blind, placebo-controlled trial** *Luana Pesco Koplowitz, MD, Ph.D.*[1], Barry Koplowitz, MS[1], Susan Kornstein, MD[2], Robert Jordan, BS[3], Johna Lucas, MD, MA, FACOG[3]; [1]DUCK FLATS Pharma, Elbridge, NY [2]Virginia Commonwealth University School of Medicine, Richmond, VA [3]Palatin Technologies, Inc., Cranbury, NJ

**INTRODUCTION:** The melanocortin-4-receptor agonist bremelanotide is being investigated for the treatment of hypoactive sexual desire disorder in premenopausal women, which is a population that uses oral contraceptives (OCs) extensively.

**RESEARCH QUESTION OR HYPOTHESIS:** The purpose of this study was to evaluate safety, tolerability, and pharmacokinetic (PK) interactions between bremelanotide and norethindrone/ethinyl estradiol (NE/EE).

**STUDY DESIGN:** A phase 1, single-center, randomized, 2-way crossover, double-blind, placebo-controlled, drug-drug interaction study was conducted in healthy premenopausal women 18-44 years of age (no OC 1 month prior to the study). Combination NE (1.0mg) and EE (0.035mg) were orally administered during the open-label phase; bremelanotide 1.75mg or placebo was subcutaneously coadministered with NE/EE in the double-blind phase.

**METHODS:** NE/EE PK assessments included $t_{max}$, $C_{max}$, and $AUC_{\tau}$ after coadministration with bremelanotide or placebo. Bremelanotide PK assessments included $t_{max}$, $C_{max}$, and $AUC_{0-\infty}$ when coadministered with NE/EE. Adverse events (AEs) were also monitored.

**RESULTS:** Thirty-six women completed the study protocol. Median NE $t_{max}$ was 2.5 hours when coadministered with bremelanotide or placebo, and the median EE $t_{max}$ was approximately 1 hour later with bremelanotide than with placebo. Statistical comparison of $AUC_{\tau}$ and $C_{max}$ between NE/EE with bremelanotide and with placebo showed that for both NE and EE, mean $AUC_{\tau}$ decreased by approximately 4%, and mean $C_{max}$ decreased by approximately 13% (not statistically significant). Median bremelanotide $t_{max}$ was approximately 0.6 hours after dosing, and median $C_{max}$ and $AUC_{0-\infty}$ were 74 ng/mL and 208 ng*h/mL, respectively. The incidence of AEs was 56% when NE/EE was coadministered with bremelanotide vs 6% with NE/EE alone. The most common AEs associated with coadministration of BMT and NE/EE were nausea and flushing vs somnolence with NE/EE alone. All AEs were mild in severity.

**CONCLUSION:** There was no statistically significant PK interaction between NE/EE and bremelanotide, and concomitant administration of NE/EE with bremelanotide was generally well tolerated.

**432. Capturing the goal-setting and treatment of high blood pressure during pregnancy in clinical practice** *Chrystian R. Pereira, Pharm. D., BCPS*[1], Sarah Westberg, Pharm.D.[1], Jean Moon, Pharm.D., BCACP[2], Annette Do, Pharm.D.[3], Becky Rosdahl, BS[3], Tanya Melnik, MD[4], Jill Bowman Peterson, MD[4]; [1]Department of Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN [2]Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN [3]University of Minnesota, Minneapolis, MN [4]General/ Preventive Medicine, University of Minnesota, Minneapolis, MN

**INTRODUCTION:** The 2013 ACOG guidelines set blood pressure goals in pregnancy and list methyldopa, nifedipine and labetalol as preferred agents. A 2015 study in Canada showed a disconnect between practicing physicians and guidelines. In 2015, the CHIPS study demonstrated benefit for tighter BP control in reducing severe maternal hypertension.

**RESEARCH QUESTION OR HYPOTHESIS:** What is the adherence to clinical guidelines in the treatment of high BP during pregnancy?

**STUDY DESIGN:** Retrospective chart review

**METHODS:** A sample of charts were collected from two clinics over a period of 27 months. Criteria for inclusion: female patients receiving care for a full pregnancy and at least one elevated BP above 140/90 during pregnancy who consented for use of chart data for research. Patients not meeting these criteria were excluded. Patient charts were reviewed, and data on gestational age, blood pressure readings, documented blood pressure goal, pharmacologic interventions for management of hypertension, as well as maternal and fetal/neonatal data were collected.

**RESULTS:** A total of 180 charts were reviewed, twenty-eight were excluded due to not meeting inclusion criteria. Forty-nine patients had elevated BP at the time of or around delivery; 28 had a single isolated high BP reading. Fourteen (18.7%) out of the remaining 75 had a documented goal BP ranging between >120/70 and <160/105. Sixteen (21%) were already on BP treatment; 10 (13.3%) continued on original therapy (including dose adjustments), three (4%) switched from an ace-inhibitor to labetalol, and three (4%) discontinued HCTZ. Six patients (8%) were newly started on treatment. Of the newly started, 3 were started on labetalol and 2 on nifedipine.

**CONCLUSION:** The majority of patients did not have a documented goal BP. Stated BP goals were variable, with some of the goals not consistent with ACOG guidelines. Most pregnant women with elevated blood pressure were not treated with antihypertensive medications, as many were isolated elevation in BP.

**433. Evaluation of prescribing patterns for the treatment of bipolar disorder in pregnancy** *Nalinoe Kernizan, Pharm.D.*[1], Alicia Forinash, FCCP, BCPS, BCACP[2], Abigail M. Yancey, Pharm.D., FCCP, BCPS[1]; [1]St. Louis College of Pharmacy, St. Louis, MO [2]Department of Pharmacy Practice, St. Louis College of Pharmacy, St. Louis, MO

**INTRODUCTION:** Uncontrolled bipolar disorder during pregnancy is associated with poor prenatal care, decreased fetal growth, and increased risk for postnatal complications such as post-partum psychosis. Mood stabilizers are first line therapy to control patients; however, pregnancy data are lacking. Often, antidepressants are initiated based on physician comfort with safety data, but this may increase mania risk. This study aims to evaluate the prescribing patterns for bipolar disorder in obstetric patients.

**RESEARCH QUESTION OR HYPOTHESIS:** What psychiatric medications are being prescribed for pregnant patients with bipolar disorder?

**STUDY DESIGN:** Retrospective chart review of patients referred to Maternal Fetal Care Center

**METHODS:** Pregnant patients with bipolar disorder, with two documented visits after January 1, 2014 and an SSM health-system delivery by October 30, 2017 were included. The primary outcome was to describe bipolar treatment regimens at first visit, throughout pregnancy, and at delivery.

**RESULTS:** Overall, 216 pregnancies were analyzed. Compared to first visit, overall psychiatric medications use (135 vs. 62), mood stabilizer regimens (75 vs. 31), and antidepressant monotherapy (26 vs. 10) increased antepartum. Forty-seven patients were initiated on mood stabilizers, most commonly lurasidone or lamotrigine. Just under half of mood stabilizer initiations were recommended by the clinic pharmacist. Fifty patients were initiated on antidepressants and 36 patients on buspirone antepartum. At delivery, only 98 patients reported adherence with psychiatric medications, including 48 on mood stabilizers and 35 on antidepressants without mood stabilizers.

**CONCLUSION:** Both physician prescribing and patient adherence with mood stabilizers during pregnancy is low. Patients on antidepressant based regimens often need continued therapy optimization.

## LATE BREAKING ORIGINAL RESEARCH

## ADR/DRUG INTERACTIONS

**434. Alcohol consumption likely to increase clopidogrel antiplatelet activity** *Steven Laizure, Pharm.D.*, Hui He, Ph.D. and Robert Parker, Pharm.D.; Department of Clinical Pharmacy, University of Tennessee Health Science Center, Memphis, TN

**INTRODUCTION:** Clopidogrel and its intermediate metabolite, 2-oxo-clopidogrel, are both hydrolyzed by human hepatic carboxylesterase-1 (CES1) to inactive metabolites. This enzyme is the primary determinant of active metabolite formation and subsequent antiplatelet activity. Alcohol is a known inhibitor of the CES1 enzyme in humans that could potentially alter clopidogrel active metabolite disposition.

**RESEARCH QUESTION OR HYPOTHESIS:** This study tests the hypothesis that alcohol will inhibit the metabolism of clopidogrel to inactive metabolites causing an increase in the formation of its active metabolite.

**STUDY DESIGN:** Estimation of the extent of the clopidogrel-alcohol interaction by determining the inhibitor concentration (*I*, alcohol concentration)/*Ki* (the inhibitory rate constant).

**METHODS:** The *Ki* was determined by incubating clopidogrel and 2-oxo-clopidogrel with increasing concentrations of alcohol in human recombinant CES1 enzyme. The inhibitor concentration, [*I*], was obtained from previous human alcohol studies published in the literature. Clopidogrel and metabolite concentrations were determined by LC-MS/MS.

**RESULTS:** The dose of alcohol in human studies ranged from 0.225 to 0.8 g/kg with corresponding alcohol maximum concentrations of 4.1 to 22.4 mM. The *Ki* values for clopidogrel and 2-oxo-clopidogrel were 80.3 and 9.3 mM, respectively. The [I]/Ki values for clopidogrel and 2-oxoclopidogrel were 0.11±0.07 and 0.95±0.56, respectively.

**CONCLUSION:** The estimated [I]/Ki ratios exceeded 0.1 indicating that both the conversion of clopidogrel and 2-oxoclopidogrel to inactive metabolites is reduced by the consumption of alcohol. By inhibiting CES1-mediated metabolism of clopidogrel and 2-oxo-clopidogrel, moderate alcohol consumption may increase active metabolite formation and antiplatelet activity in humans.

## CARDIOVASCULAR

**435. The effects of propofol on extracorporeal membrane oxygenation oxygenator exchange** *Kelsey Browder, Pharm.D.*, Ayesha Ather, Pharm.D., BCPS, Komal Pandya, Pharm.D., BCCCP; University of Kentucky HealthCare, Lexington, KY

**INTRODUCTION:** Concerns with propofol administration to patients on extracorporeal membrane oxygenation (ECMO) originate from propofol use during cardiopulmonary bypass (CPB) and the potential for propofol to alter the diffusion of oxygen across the membrane. The perceived potential for oxygenation issues has caused benzodiazepine use to increase as the sedative of choice in the ECMO population.

**RESEARCH QUESTION OR HYPOTHESIS:** The objective of this study was to determine if propofol administration to ECMO patients at our institution would result in oxygenator exchange more often than patients who did not receive propofol.

**STUDY DESIGN:** This single center retrospective study was conducted in the cardiothoracic intensive care unit. Included patients were 18 or older on venovenous ECMO support between January 1, 2015 and January 31, 2018. Patients were excluded if they required ECMO support for less than 48 hours or greater than 21 days.

**METHODS:** Patient demographics collected included benzodiazepine use, cumulative opioid dose on ECMO, intensive care unit (ICU) and hospital length of stay, duration of ECMO, and in hospital mortality. Patients who received propofol were compared to patients who did not receive propofol for outcomes including duration of ECMO and oxygenator exchanges per ECMO day.

**RESULTS:** 77 patients were analyzed. There were five patients in the propofol arm that required oxygenator exchanges and 7 patients in

the control arm. The total number of oxygenator exchanges per ECMO day was no different between groups (0 exchanges per day vs. 0 exchanges per day; p=0.49). Between those who required an oxygenator exchange and those who did not, there was no difference in the cumulative dose of propofol received per ECMO hour (0.64 mg/kg/hr vs. 0.96 mg/kg/hr; p=0.125).

**CONCLUSION:** Propofol use in patients on ECMO does not seem to increase the number of oxygenator exchanges.

**436. Re-vecto: idarucizumab drug administration surveillance program results** *John Fanikos, RPh, MBA*[1], Debra Murwin, BS, MBA[2], Fredrik Gruenenfelder, Ph.D.[3], Igor Tartakovsky, MD[4], Lionel Riou Franca, Ph.D.[4], Paul Reilly, Ph.D.[5], Deirdre A Lane, Ph.D.[6], Ken Butcher, MD, Ph.D.[7]; [1]Brigham & Women's Hospital, Wakefield, MA [2]Boehringer Ingelheim Pharmaceuticals, Columbus, OH [3]Boehringer Ingelheim Pharma GmbH & Co. KG, Ingelheim am Rhein, Germany [4]Boehringer Ingelheim International GmbH, Ingelheim, Germany [5]Boehringer Ingelheim, Ridgefield, CT [6]University of Birmingham, Institute of Cardiovascular Sciences, Birmingham, United Kingdom [7]University of Alberta, Edmonton, AB, Canada

**INTRODUCTION:** Idarucizumab is indicated for emergency surgery/urgent procedures and in life-threatening or uncontrolled bleeding in patients treated with dabigatran, requiring rapid reversal of anticoagulant effect. We present data from a global surveillance program of idarucizumab use in adult patients.

**RESEARCH QUESTION OR HYPOTHESIS:** The objective was to evaluate idarucizumab usage patterns in a hospital pharmacy setting.

**STUDY DESIGN:** Non-interventional, international study based on medical record review.

**METHODS:** Patients ≥18 years of age treated with idarucizumab, dispensed at hospital pharmacies or hospital clinical units, and not participating in a dabigatran or idarucizumab clinical trial were eligible. Anonymized data were collected on hospital pharmacy characteristics, patient characteristics and idarucizumab utilization.

**RESULTS:** 359 patients (75%, >70 years of age) from 12 countries across Asia Pacific (14%), Europe (42%), and North America (44%) participated. The majority of hospitals (N=63) were public (68%), with centralized pharmacies (86%). Previous anticoagulant treatment was dabigatran (bid: 150 mg [49%], 110 mg [33%], 75 mg [6%], 220 mg [0.3%]; qd: 110 mg [3%], 150 mg [2%], 75 mg [0.3%]; unknown dose [5%]), rivaroxaban (1%), apixaban (0.3%), or unknown (2%). Indications for idarucizumab use were bleeding (58%), emergency surgery/procedure (36%), planned surgery/procedure (3%), and other (3%). Patients received 5 g (2 vials, 95%), 2.5 g (1 vial, 3%) or other dose (2%). Six patients received a second dose of 5 g (rebleeding/coagulation test increase [N=5]; urgent intervention [N=1]). Bleeds (N=205) were most frequently gastrointestinal (45%) or intracranial (39%). Bleed type (N=201) was spontaneous (62%), traumatic (23%), post-procedural (4%) or not reported (10%). Most common surgery types (N=141) were gastrointestinal (26%), orthopedic (22%), vascular (19%) or thoracic (11%, including cardiac).

**CONCLUSION:** Post-marketing surveillance shows new information on patterns of use and pharmacy characteristics. Second-dose frequency was low and consistent with the Registration Trial (REVERSE AD).

**437. Trends in high-intensity statin use among patients >75 years for atherosclerotic cardiovascular disease secondary prevention** Michele Wood, Pharm.D., BCPS[1], Thomas Delate, Ph.D., MS[2], *Sheila Stadler, Pharm.D., BPCS-AQ Cardiology, CLS*[1], Anne Denham, Pharm.D., BCPS-AQ Cardiology[1], Leslie Ruppe, Pharm.D., BCPS-AQ Cardiology CLS[1], Roseanne Hornak, Pharm.D., BCPS[1], Kari L. Olson, BSc, Pharm.D., BCPS, FCCP[1]; [1]Clinical Pharmacy Cardiac Risk Service, Kaiser Permanente Colorado, Aurora, CO [2]Department of Clinical Pharmacy, Kaiser Permanente Colorado, Aurora, CO

**INTRODUCTION:** Atherosclerotic cardiovascular disease (ASCVD) remains the leading cause of death in the United States. High intensity statin therapy (HIST) is recommended to decrease the risk of recurrent ASCVD. While there is clinical debate about the benefit of HIST in older patients, the prevalence by which HIST is used in this population is unknown.

**RESEARCH QUESTION OR HYPOTHESIS:** What proportion of patients >75 years of age with ASCVD receive HIST and what patient characteristics are associated with HIST use?

**STUDY DESIGN:** Cross-sequential study conducted within an integrated healthcare delivery system.

**METHODS:** Administrative database queries were used to collect data from January 1, 2007 to December 31, 2016. Patients had to be ≥ 76 years and have validated ASCVD (myocardial infarction, cardiac stent, percutaneous coronary intervention, coronary artery bypass graft) as of the January 1st (index date) for each year. Patients could be included in multiple years if they met criteria. Statin intensity was determined using the type and dose of statin sold within 180 days of the index date. Patients who had HIST in any year were categorized in the HIST group. Logistic regression modeling was utilized to determine characteristics associated with HIST use.

**RESULTS:** There were 5,453 patients included (average age 79.8 years; 61.1% male), of which 2,119 (38.9%) received HIST at some point during the study period. The percentage of patients who received HIST steadily increased from 14.5% as of January 1, 2007 to 41.4% as of July 1, 2016 (p<0.05 for trend). Factors associated with HIST use included younger age, male sex, lower burden of chronic disease, as well as antiplatelet, beta-blocker, and aspirin use.

**CONCLUSION:** The use of HIST increased substantially in patients >75 years with ASCVD over the 10-year study period. Future studies should evaluate cardiovascular outcomes with HIST use in this population.

## CRITICAL CARE

**438. Comparison of sodium acetate buffering capacity in critically ill patients with and without cirrhosis** *Brittany Bissell, Pharm.D., BCCCP*[1], Alexander Flannery, Pharm.D., BCCCP, BCPS[1], Komal Pandya, Pharm.

D.[2], Melissa Thompson Bastin, Pharm.D., BCPS[1]; [1]Department of Pharmacy Services, University of Kentucky HealthCare, Lexington, KY [2]University of Kentucky Medical Center, Lexington, KY

**INTRODUCTION:** Sodium acetate (NAc) is a buffering agent that is substituted for sodium bicarbonate (HCO3) for various indications in intensive care unit (ICU) patients. Acetate is converted to bicarbonate through the citric acid cycle, mainly by the liver and skeletal muscle. As such, patients with liver disease, like cirrhosis, may not convert NAc to HCO3. During times of drug shortage, NAc is recommended as an alternative for HCO3. However, little data exist regarding the efficacy of NAc as a buffering agent for those with cirrhosis.

**RESEARCH QUESTION OR HYPOTHESIS:** We sought to evaluate the serum bicarbonate (sHCO3) response, defined as an increase in sHCO3 value with concomitant pH increase (of any value), with NAc in those with cirrhosis versus those without.

**STUDY DESIGN:** This was a single-center retrospective cohort study of adult patients with and without cirrhosis admitted to the Medical ICU over a 6 month period of HCO3 shortage who received NAc.

**METHODS:** Electronic medical records were utilized to collect NAc utilization, demographics, laboratory values, and clinical outcomes. Response to NAc was compared between patients with and without cirrhosis.

**RESULTS:** 103 orders for sodium acetate were found, with 53% administered in patients with cirrhosis (n=55). There was no difference between groups in baseline HCO3 (p=0.22) or pH (p=0.66). Despite cirrhotics receiving a higher average NAc dose (40 vs. 22.5 mEq, p=0.03), no patients in either group met criteria for response. Only 10.9% of patients with cirrhosis had an increase in sHCO3, compared to 4.2% of those without (p=0.26). A pH increase was only demonstrated in 7.3% of cirrhotics versus 4.2% of non-cirrhotics (p=0.67). No difference was seen in length of stay or mortality.

**CONCLUSION:** NAc had limited buffering capacity in those with and without cirrhosis in this cohort; however, sample size was limited. Discretion should be exercised before use in ICU patients, given limited evidence for efficacy or safety.

**439. Obesity and the negative impact on propofol usage for ICU sedation** Danielle Tompkins, Pharm.D.[1], Sean Kane, Pharm.D.[2], *Scott Benken, Pharm.D., BCPS-AQ Cardiology*[1]; [1]University of Illinois at Chicago, Chicago, IL [2]Rosalyn Franklin College of Pharmacy, North Chicago, IL

**INTRODUCTION:** International guidelines for sedation in ventilated patients recommend using non-benzodiazepine sedatives over others. There have been no studies evaluating the use of propofol for continuous ICU sedation in obese (BMI ≥30) vs. non-obese patients.

**RESEARCH QUESTION OR HYPOTHESIS:** Total body weight (TBW) dosing of propofol has higher rates of oversedation and propofol-related side effects in obese patients when compared to non-obese patients.

**STUDY DESIGN:** Single-center retrospective cohort study.

**METHODS:** Patients who received a cumulative duration of propofol of at least 24 hours from 1/2018 – 1/2012 were evaluated for inclusion. Data was obtained from the MIMIC III Database, an open-access research database.

**RESULTS:** Nine hundred ninety eight patients were identified with 277-obese and 457-non-obese having complete data. The median age (IQR) was 62(53-69) vs. 64(50-76) with 56.3% vs. 62.4% male, 72.2% vs. 73.5% Caucasian, and median BMI 35(32.3-39.3) vs. 24.9(22.6-27.1) [p<0.001] respectively. Obese patients had a higher median cumulative dose of propofol (20819 mg [11812-29308mg] vs. 8844mg [4995-16935mg]; p<0.001). Rates of oversedation were similar between the two groups (28.2% vs 28.2%; p=0.984) with similar median deviations from goal RASS targets (-0.23 [-0.64 to -0.07] vs. -0.31 [-0.68 to -0.07]; p=0.077). Time on the ventilator, ICU length of stay, and mortality did not differ between groups. There were significantly more obese patents with hypertriglyceridemia (4% vs. 1.3%; p=0.02) and numerically more bradycardia (38.3% vs. 32.2%; p=0.09) though this did not reach significance. Class 3 obese patients compared to non-obese had a longer propofol duration (p=0.04), higher total propofol exposure (p<0.0001), and higher triglycerides (p=0.001). Cox proportional modeling demonstrated a longer time to liberation from mechanical ventilation (p=0.024) in class 3 obese patients vs. non-obese.

**CONCLUSION:** Obesity is associated with higher cumulative exposure to propofol during continuous sedation while mechanically ventilated, especially in class 3 obese patients. This may impact duration of mechanical ventilation and safety parameters. Future study is warranted.

**440. Effect of endothelin-b receptor simulation on neurogenesis markers in rat brain following stroke** *Divya Khandekar, B.Pharm, MS*[1], Amaresh Ranjan, Ph.D[2], Seema Briyal, Ph.D[2], Rhea Dhingra, BS[2], Rahul Mehta, BS[2], Anil Gulati, MD, Ph.D[2]; [1]Chicago College of Pharmacy, Midwestern University, Downers Grove, IL [2]Department of Pharmaceutical Sciences, Midwestern University, Downers Grove, IL

**INTRODUCTION:** Endothelin-B receptors in the brain have neurogenic capacity. Stimulation of these receptors by an agonist, IRL-1620, improves neurological functions following cerebral ischemia. In this study, we have evaluated the effect of IRL-1620 on neurogenesis.

**RESEARCH QUESTION OR HYPOTHESIS:** We hypothesized that IRL-1620 would increase the expression of neurogenesis markers.

**STUDY DESIGN:** *In vivo* experiments consisted of no ischemia, ischemia+vehicle and ischemia+IRL-1620 groups (N=4). *In vitro* experiments had hypoxia+vehicle and hypoxia+IRL-1620 groups.

**METHODS:** Permanent middle cerebral artery occlusion (MCAO) was used to induce cerebral ischemia in male Sprague-Dawley rats. Following MCAO, animals received three intravenous injections of saline (vehicle) or IRL-1620 (5 µg/kg) at 4, 6, and 8 hours for 24 hours study; and 3 injections on day 0, 3, and 6 post-MCAO for 7 days study. Animals were sacrificed and brains were processed to evaluate the expression of neurogenesis markers (NeuroD1, DoubleCortin and HuC/HuD) and stem cell markers (Sox2 and Oct4), in the cerebral hemispheres, using immunoblotting technique. Primary culture of adult rat brain cells were exposed for 24 hours to vehicle+hypoxia

($3.5\%O_2$, 37°C) or IRL-1620 (1ng/ml)+hypoxia and processed for immunofluorescence.

**RESULTS:** IRL-1620 treatment produced a significant (P<0.0001) improvement in neurological deficit compared to vehicle at 24 hours and day 7 (65.13% & 69.23%, respectively) post MCAO. Western blot analysis at 24 hours showed an increase in expression of NeuroD1 (p=0.0003), HuC/HuD (p=0.0373) and DoubleCortin (p=0.0354) in the IRL-1620 group compared to vehicle in the right infarcted hemispheres, while no change was observed on day 7. IRL-1620 did not produce any change in expression of Oct4 and Sox2. Immunofluorescence analysis of cultured cells confirmed above finding of elevated expression of NeuroD1 along with an increase in NeuN (neural marker for mature neurons) in IRL-1620-treated hypoxic cells compared to vehicle.

**CONCLUSION:** Stimulation of endothelin-B receptors with IRL-1620 enhances expression of neurogenic markers leading to functional recovery.

## EDUCATION/TRAINING

**441. This is how i think: evaluation of a preceptor development program on incorporating the pharmacists' patient care process into experiential teaching** Keri Hager, Pharm.D.[1], Allyson Schlichte, Pharm.D., MBA, BCACP[2], *Caitlin K. Frail, Pharm.D., MS, BCACP*[3]; [1]Department of Pharmacy Practice and Pharmaceutical Sciences, University of Minnesota College of Pharmacy, Duluth, MN [2]Fairview Health Services, Minneapolis, MN [3]Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN

**INTRODUCTION:** Profession-wide efforts are ongoing to create consistency in using the Comprehensive Medication Management (CMM) Pharmacists Patient Care Process (PPCP) in practice, education, and research. Exposing students effectively to PPCP in experiential rotations is critical to ensuring consistency among future practitioners. This further requires active and explicit incorporation of the PPCP into precepting.

**RESEARCH QUESTION OR HYPOTHESIS:** How does a preceptor development continuing education (CE) program on incorporating PPCP influence: 1) preceptor perceptions of incorporation of PPCP into experiential teaching, and 2) confidence in ability to articulate PPCP to team members and students?

**STUDY DESIGN:** Pre-post survey design using Likert-type and open-ended questions

**METHODS:** An online preceptor development CE program was created to address the components of PPCP and application in experiential learning. Pre-post survey questions were developed to assess perceptions of whether preceptors incorporate PPCP into their teaching, and their confidence in articulating PPCP to team members and students. Pre-post data were assessed using Wilcoxon Signed Rank Test.

**RESULTS:** A total of 158 preceptors enrolled in the program; 114 usable pre- and 108 post surveys were completed. Preceptors' perception of whether they incorporate PPCP with IPPE students did not change significantly after completing the program (1.98 v. 1.88, p=0.317); however, APPE preceptors were less likely to strongly agree they were incorporating the PPCP into precepting after (1.91 vs. 1.72, p=0.016). Preceptors felt increased confidence in their ability to articulate the PPCP to both their team members (2.07 vs. 1.60, p=0.000), and students (2.01 vs. 1.63, p=0.000) following their completion of the program.

**CONCLUSION:** An online preceptor development CE was effective at increasing confidence in preceptors' ability to articulate the PPCP to team members and students. Further efforts should be focused on preceptor development in this area.

## ENDOCRINOLOGY

**442. Metastasis-promoting and -suppressing potentials of glucose-lowering treatment: A nationwide propensity score matched cohort study** *Yoojin Noh, Doctor of Pharmacy, expected 2020*[1], Sang-Min Jeon, Ph.D.[2], Sooyoung Shin, Pharm.D.[2]; [1]Massachusetts College of Pharmacy and Health Science, Worcester, MA [2]College of Pharmacy, Ajou University, Suwon, Korea, Republic of (South)

**INTRODUCTION:** Preclinical data suggested that dipeptidyl peptidase-4 (DPP-4) inhibitors may promote metastatic progression of pre-existing cancer via nuclear factor erythroid 2 related factor 2 (NRF2) activation.

**RESEARCH QUESTION OR HYPOTHESIS:** We aimed to investigate the association between different glucose lowering treatments, including DPP-4 inhibitors and metformin, both with potential NRF2 modulating effects, and new-onset metastatic cancer among type 2 diabetes patients with comorbid incident cancer.

**STUDY DESIGN:** This population-based cohort study included 223,530 diabetic patients newly diagnosed with primary cancer during 2009-2011 in Korea.

**METHODS:** The patients were categorized into five study cohorts in accordance with treatment modalities during the follow-up until the end of 2016: no-antidiabetic drugs (no-AD), metformin, DPP-4 inhibitors, metformin+DPP-4 inhibitors, and insulin treatment. Following propensity score (PS) matching in a 1:1 ratio against the no-AD group, 18,805 patients in metformin, 1,865 in DPP-4 inhibitors, 31,074 in metformin+DPP-4 inhibitors, and 1,895 patients in insulin groups were identified for cohort entry and analyzed against the corresponding number of no-AD patients in each PS-matched comparison pair.

**RESULTS:** Metastatic risk was lower with metformin plus or minus DPP-4 inhibitors (HR 0.84, 95% CI 0.79-0.90 and 0.87, 0.80-0.95, respectively), not significantly associated with DPP-4 inhibitors (0.99, 0.77-1.29) except after thyroid cancer (3.89, 1.01-9.64), and higher with insulin therapy (1.81, 1.46-2.24) compared with no-AD use for all cancers combined.

**CONCLUSION:** In conclusion, DPP-4 inhibitor therapy was not associated with significant risk of cancer metastasis relative to no-AD therapy, irrespective of patient age and sex, except after thyroid cancer, while metastatic risk was decreased with metformin treatment among type 2 diabetes patients with preexisting cancer.

## GASTROENTEROLOGY

**443. Non-immunosuppressed inflammatory bowel disease patients have similar varicella zoster cell-mediated immunity as an older group from whom herpes zoster immunization is recommended** *Kate Berlin, BS*[1], Sue McCrone, BS[1], Freddy Caldera, D.O.[2], Mary Hayney, Pharm.D., MPH[1]; [1]University of Wisconsin-Madison School of Pharmacy, Madison, WI [2]University of Wisconsin-Madison School of Medicine & Public Health, Madison, WI

**INTRODUCTION:** Patients with inflammatory bowel disease (IBD) have an inherently increased risk of herpes zoster (HZ) compared to healthy counterparts. A HZ subunit vaccine was recently approved and can be safely administered to patients with IBD with or without concurrent immunosuppressive medications. Reactivation of varicella zoster virus (VZV) results in HZ, and strong cell-mediated immunity prevents reactivation of HZ.

**RESEARCH QUESTION OR HYPOTHESIS:** Young patients with IBD aged 35-49 have similar cell-mediated immunity to varicella zoster virus as healthy individuals aged 50-59 years, for whom the zoster vaccine is currently recommended.

**STUDY DESIGN:** Single-center, cross-sectional, prospective study.

**METHODS:** Serum samples were obtained for interferon-γ ELISPOT assays to assess cell-mediated immunity to varicella zoster virus. Patients (n=35) were divided into 1) healthy controls age 50-59 years (n=12) or 2) patients with IBD age 35-49 years receiving no therapy or aminosalicylate monotherapy (n=23) with prior history of VZV manifesting as chicken pox. Interferon-γ ELISPOT plate results were quantified with AID EliSpot Reader System V3.

**RESULTS:** Per study design, healthy patients were older than patients with IBD (median, 51 years [IQR 50-56] vs 44 years [IQR 38-48]; p<0.001, Mann Whitney U). The median duration of IBD was 120 months [IQR 68-179]. Healthy patients demonstrated similar VZV interferon-γ ELISPOT results (median 43 spots, [IQR 29-100]) compared to patients with IBD receiving no therapy or aminosalicylate monotherapy (median 42 spots, [IQR 10-96]; p=0.53, Mann Whitney U). The interferon-γ ELISPOT results describe the robustness of cell-mediated immune response to VZV.

**CONCLUSION:** Young patients with IBD receiving no therapy or aminosalicylate monotherapy had similar cell-mediated immunity to VZV as healthy fifty year olds, a group in which HZ immunization is indicated. Given the low cell-mediated immunity to VZV demonstrated by IBD patients in our study, HZ immunization at ages younger than 50 years may be beneficial in IBD patients who are at increased risk of HZ.

## HEMATOLOGY/ANTICOAGULATION

**444. Same-tt2r2 score predicts optimal anticoagulation in a predominantly minority population at a liberal cutoff and for indications other than atrial fibrillation** *Kunkun Wang, Pharm.D. Candidate*[1], Lucy Yun Lu, Pharm.D., MS, BCPS[2], Mengistu Simegn, MD[2], Richard Asinger, MD[2]; [1]University of Minnesota, Minneapolis, MN [2]Hennepin County Medical Center, Minneapolis, MN

**INTRODUCTION:**

Decision making tools that predict optimal anticoagulation may guide management. The SAMe-$TT_2R_2$ score (sex female, age < 60 years, medical history [>2 comorbidities], treatment [interacting drugs], tobacco use [doubled points], race non-Caucasian [doubled points]) is a widely used tool which was derived and validated from the AFFIRM trial population to predict the quality of anticoagulation in patients with non-valvular atrial fibrillation (NVAF).

**RESEARCH QUESTION OR HYPOTHESIS:**

Is the SAMe-$TT_2R_2$ score derived from a trial cohort with < 10% minority is applicable in a predominant minority population and for indications other than NVAF?

**STUDY DESIGN:**

Single center, retrospective review

**METHODS:**

A total of 336 patients (median age 62 year, 62% male and 54% non-Caucasians) on long term vitamin K antagonist (VKA) and regular follow up for at least 12 months between February 2016 and April 2017 were identified from the Hennepin County Medical Center anticoagulation clinic registry. For each patient, SAMe-$TT_2R_2$ score and time in therapeutic range (TTR) were computed. Logistic regression was used to assess correlation between grouped SAMe-$TT_2R_2$ scores and TTR. Receiver operating characteristic curve was then used to identify the best cutoff for predicting desired TTR and compute accuracy and positive likelihood ratio.

**RESULTS:**

Of total 336 patients, indications for VKA were NVAF in 40% and venous thromboembolic disease, prosthetic heart valve and others in 60%. There is statistically significant negative correlation between SAMe-$TT_2R_2$ and TTR (coefficient=-0.18, P= $2 \times 10^{-16}$). SAMe-$TT_2R_2$ of less or equal to 3 was identified as the best threshold for predicting TTR of >65% with accuracy and positive likelihood ratio of 63.4% and 1.73, respectively.

**CONCLUSION:**

SAMe-$TT_2R_2$ score predicts optimal anticoagulation at liberal cutoff than previously thought in predominant minority inner city patient population with NVAF and in those with other indications for long-term VKA.

**445. Validation of an argatroban dosing protocol in an academic medical center** *Paige Waugh, Pharm.D.*[1], Shaun Keegan, Pharm.D.[2], Christopher Droege, Pharm.D.[2], Eric Mueller, Pharm.D.[2], Neil Ernst, Pharm.D.[2]; [1]Duquesne University Mylan College of Pharmacy, Pittsburgh, PA [2]University of Cincinnati Medical Center, Cincinnati, OH

**INTRODUCTION:** Argatroban is indicated for the treatment of heparin-induced thrombocytopenia. Optimal starting dose and titration differ between critically-ill (CI) and non-critically patients (NCI), as patients with higher severity of illness have been shown to require lower doses.

**RESEARCH QUESTION OR HYPOTHESIS:** This study evaluated the efficacy and safety of an institutional argatroban dosing protocol and looked to identify independent variables associated with 1) failure to achieve therapeutic active partial thromboplastin time (aPTT) within 24 hours of initiation, and 2) therapeutic dose requirements <0.51 mcg/kg/min.

**STUDY DESIGN:** Single health-system, retrospective chart review.

**METHODS:** This cohort study evaluated adult patients who received an argatroban infusion for at least 24 hours. Multivariate logistic regression analyses were performed to identify predictors for non-therapeutic aPTTs and a therapeutic dose requirement <0.51 mcg/kg/min. Patients were divided into per-protocol (defined as starting dose and titrations following institutional protocol) or per-titration (defined as differing starting dose, but titrations following institutional protocol) groups. Protocol starting argatroban dose in CI and NCI patients is 0.5 and 1 mcg/kg/min, respectively, with an aPTT goal of 45-75 seconds.

**RESULTS:** Ninety patients (62 per-protocol [35 CI]; 28 Per-titration [25 CI]) were included. Eighty-one (90%) patients achieved a therapeutic aPTT within 24 hours and no difference was observed between per-protocol and per-titration groups. Mean time to therapeutic aPTT was similar between groups. One major bleed and no minor bleeding or clot extensions occurred. No predictors for non-therapeutic aPTTs were identified. Total SOFA (sequential organ failure assessment) score >6 (OR 13.5, 95% CI 1.6–134.8) at argatroban initiation was an independent predictor for a therapeutic dose <0.51 mcg/kg/min.

**CONCLUSION:** The institution's argatroban protocol is both safe and effective at achieving a therapeutic aPTT within 24 hours in CI and NCI patients. This occurred in a similar timeframe between groups with no difference in adverse events. SOFA score may be an effective identifier for further dose reductions.

## INFECTIOUS DISEASES

**446. Evaluation of risk factors and empiric antimicrobial regimens in acinetobacter baumannii bacteremia and impact on patient outcomes** *Taylor Morrisette, Pharm.D.*[1], Chelsea Mitchell, Pharm.D.[2], Tate Cutshall, Pharm.D.[3], Jennifer Twilla, Pharm.D., BCPS[4]; [1]Department of Pharmacy, University of Colorado Hospital and Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO [2]Department of Pharmacy, Froedtert Hospital, Milwaukee, WI [3]Department of Pharmacy, University of Alabama at Birmingham Hospital, Birmingham, AL [4]Department of Pharmacy, Methodist University Hospital, Memphis, TN

**INTRODUCTION:** *Acinetobacter baumannii* (AB) is a Gram-negative coccobacillus that has emerged as a prominent nosocomial pathogen frequently causing bacteremia. Prior studies have identified risk factors (RFs) associated with AB bacteremia (ABB) development, including broad-spectrum antimicrobial utilization, presence of indwelling devices, recent invasive procedures, and prolonged intensive care unit stays; however, few reports have evaluated these RFs in conjunction with empiric antimicrobial regimens (EARs) and associated patient outcomes.

**RESEARCH QUESTION OR HYPOTHESIS:** Does the choice of EARs in the presence of RFs for ABB impact patient outcomes?

**STUDY DESIGN:** Multi-center, retrospective cohort of adult patients with RFs and positive blood cultures (BCs) for AB.

**METHODS:** Patients were categorized into two groups based on the EAR chosen prior to BC positivity (group one: patients initiated on meropenem; group two: patients initiated on any other EAR). Polymicrobial bacteremia and blood cultures (BCs) for *Acinetobacter* spp. other than AB were excluded. The primary endpoint was time to negative BC(s); secondary endpoints included hospital length of stay (LOS), in-hospital mortality, 30-day readmission, and recurrent bacteremia.

**RESULTS:** Of the 64 patients screened, 25 met inclusion criteria (meropenem group: 13 patients, other EAR group: 12 patients). No statistically significant differences were noted between baseline characteristics, RFs for ABB, or infection source between the groups. While not statistically significant, the meropenem group had a faster time to BC clearance (1.9 days [1.5-3.4] vs. 3.3 days [1.5-4.2]; p=0.50) and a decreased hospital LOS (31.3 $\pm$ 32.9 days vs. 38.3 $\pm$ 45.4 days; p=0.66). In-hospital mortality was observed more frequently in patients receiving meropenem (38% vs. 8%; p=0.16). There were no differences in 30-day readmissions or recurrent bacteremia.

**CONCLUSION:** For patients with suspected infection, RFs for ABB should guide choice of EARs, as meropenem may lead to a faster time to BC clearance. Prospective trials are needed to validate the optimal choice of EARs for patients at risk for ABB.

**447. Effect of renal function on efficacy of eravacycline: pooled analysis of ignite1 and ignite4** Allyson Fonte, Pharm.D., Kenneth Lawrence, Pharm.D., Sergey Izmailyan, BS, *Steven Kolkin, Pharm.D., MS*; Medical Affairs, Tetraphase Pharmaceuticals, Watertown, MA

**INTRODUCTION:** Treatment failure risk increases in certain complicated intra-abdominal infection (cIAI) subgroups. Eravacycline (ERV), a novel fluorocycline antibiotic, was evaluated in two phase 3 randomized control trials (RCTs) to assess its efficacy and safety vs a carbapenem in adults with cIAI. These RCTs met the primary endpoints of non-inferiority for clinical response.

**RESEARCH QUESTION OR HYPOTHESIS:** We sought to explore how baseline creatinine clearance (CLCR) affects the clinical efficacy of ERV.

**STUDY DESIGN:** IGNITE1 and IGNITE4 were randomized, double-blind, non-inferiority phase 3 trials.

**METHODS:** In IGNITE1 and IGNITE4, adult patients hospitalized with cIAI were randomized to ERV vs ertapenem or meropenem, respectively. Clinical outcome in the microbiological-intent-to treat (micro-ITT) population at the test of cure visit (TOC), 25-31 days after randomization, was the primary efficacy endpoint. Subjects were classified into 4 renal function categories based on baseline CLCR calculated by the Cockcroft-Gault equation.

**RESULTS:** The micro-ITT population consisted of 846 patients who grew at least one pathogen consistent with cIAI in baseline cultures.

Clinical outcomes analyzed by categories of baseline renal function in the micro-ITT population at TOC were:

| Group | ERV % Cure (n/N) | CT % Cure (n/N) | Difference | 95% CI (LL, UL) |
|---|---|---|---|---|
| All subjects | 88.7 (368/415) | 89.3 (385/431) | -0.7 | (-4.9, 3.6) |
| Moderately to Severely Decreased [CLCR 15 to <60 mL/min] | 84.8 (28/33) | 75.9 (22/29) | 9.0 | (-10.8, 30.0) |
| Mildly Decreased to Normal [CLCR ≥ 60 mL/min] | 89.0 (331/372) | 91.7 (353/385) | -2.7 | (-7.0, 1.5) |
| Augmented [CLCR ≥ 130 mL/min] | 91.9 (137/149) | 92.8 (128/138) | -0.8 | (-7.2, 5.8) |

CT=Comparator Therapy; n=number of subjects with clinical cure; N=number of subjects within a specific category; ESRD=end-stage renal disease; NE=Not Evaluable

**CONCLUSION:** ERV maintained efficacy in treating patients across a broad range of altered renal function. ERV provides an alternative to carbapenems and beta-lactams with beta-lactamase inhibitors for empiric treatment of cIAI.

**448. Efficacy of eravacycline in obese patients: pooled analysis of ignite1 and ignite4** Allyson Fonte, Pharm.D., Kenneth Lawrence, Pharm.D., Sergey Izmailyan, BS, *Steven Kolkin, Pharm.D., MS*; Medical Affairs, Tetraphase Pharmaceuticals, Watertown, MA

**INTRODUCTION:** Treatment failure risk increases in certain complicated intra-abdominal infection (cIAI) subgroups. Eravacycline (ERV), a novel fluorocycline antibiotic, was evaluated in two phase 3 randomized control trials (RCTs) to assess its efficacy and safety vs a carbapenem in adults with cIAI. These RCTs met the primary endpoints of non-inferiority for clinical response.

**RESEARCH QUESTION OR HYPOTHESIS:** We sought to explore clinical outcomes in obese patients treated with ERV for cIAI.

**STUDY DESIGN:** IGNITE1 and IGNITE4 were randomized, double-blind, non-inferiority phase 3 trials.

**METHODS:** In IGNITE1 and IGNITE4, adult patients hospitalized with cIAI were randomized to weight-based dose ERV (1 mg/kg IV q12h) vs ertapenem or meropenem, respectively. Clinical outcome in the microbiological-intent-to treat (micro-ITT) population at the test-of-cure (TOC) visit, 25-31 days after randomization, was the primary efficacy endpoint. Subjects were classified into 4 categories based on body mass index (BMI).

**RESULTS:** The micro-ITT population consisted of 846 patients who grew at least one pathogen consistent with cIAI in baseline cultures.

Clinical outcomes analyzed by BMI in the micro-ITT population at TOC were:

| Group | BMI (median [min, max]) | ERV % Cure (n/N) | CT % Cure (n/N) | Difference | 95% CI (LL, UL) |
|---|---|---|---|---|---|
| All subjects | 26.9 [17.1, 73.6] | 88.7 (368/415) | 89.3 (385/431) | -0.7 | (-4.9, 3.6) |
| Obese [BMI ≥ 30 kg/m$^2$] | 32.8 [30, 73.6] | 85.3 (110/129) | 89.1 (115/129) | -3.9 | (-12.3, 4.4) |
| Overweight [BMI 25-29.9 kg/m$^2$] | 27.20 [25, 29.98] | 87.0 (127/146) | 89.0 (130/146) | -2.1 | (-9.8, 5.6) |
| Healthy weight [BMI 18.5-24.9 kg/m$^2$] | 23 [18.5, 24.98] | 94.0 (126/134) | 89.8 (132/147) | 4.2 | (-2.4, 11.0) |
| Underweight [BMI < 18.5 kg/m$^2$] | 17.41 [17.1, 18.48] | 83.3 (5/6) | 88.9 (8/9) | -5.6 | (-49.6, 33.1) |

CT=comparator therapy; n=number of subjects with clinical cure; N=number of subjects within a specific category; NE=not evaluable

**CONCLUSION:** ERV was effective in treating patients regardless of BMI. ERV provides an alternative to carbapenems and beta-lactams with beta-lactamase inhibitors for empiric treatment of cIAI.

**449. A multi-center evaluation of outcomes following treatment with ceftolozane-tazobactam** Elizabeth Hirsch, Pharm.D.[1], Delaney Hart, BS[1], Ashley Piche, BS[1], Ashley Cubillos, Pharm.D.[2], Kirthana Beaulac, Pharm.D.[3], Aiman Bandali, Pharm.D.[4], Janet Raddatz, Pharm.D.[5], Kimberly Boeser, Pharm.D.[2], *Brandon Dionne, Pharm.D., BCPS-AQ ID, AAHIVP*[6], Laura Puzniak, Ph.D.[5], Monica V Mahoney, Pharm.D., BCPS-AQ ID[7], Elizabeth Gancher, MD[8]; [1]University of Minnesota College of Pharmacy, Minneapolis, MN [2]University of Minnesota Medical Center, Minneapolis, MN [3]Tufts Medical Center, Boston, MA [4]Hahnemann University Hospital, Philadelphia, PA [5]Merck & Co., Inc, Kenilworth, NJ [6]Brigham and Women's Hospital, Boston, MA [7]Department of Pharmacy, Beth Israel Deaconess Medical Center, Boston, MA [8]Drexel University College of Medicine, Philadelphia, PA

**INTRODUCTION:** Ceftolozane-tazobactam (C/T) is a novel cephalosporin combined with a β-lactamase inhibitor, approved in 2015 for treatment of complicated urinary tract infection and complicated intra-abdominal infection and currently being studied for ventilated nosocomial pneumonia. C/T has demonstrated in vitro activity against multidrug-resistant (MDR) *Pseudomonas aeruginosa* and Enterobacteriaceae; however, patient outcomes have been infrequently reported.

**RESEARCH QUESTION OR HYPOTHESIS:** What are the real-world clinical outcomes following treatment with C/T?

**STUDY DESIGN:** Retrospective, 5-center cohort study.

**METHODS:** Adult inpatients treated with C/T for ≥48 hours, between 2015-2018, were included. Clinical and microbiologic data were extracted from electronic records. The primary outcome of clinical cure, assessed in patients receiving ≥72 hours of C/T therapy, was

defined as no escalation of or additional therapy with hospital discharge indicating clinical stability. Secondary outcomes included 30-day all-cause mortality and length of stay (LOS). Isolates were characterized as MDR if resistant to 3-5 categories of antipseudomonal agents, and extensively-drug resistant (XDR) if resistant to ≥6 categories.

**RESULTS:** Thirty-five patients were included; mean patient age was 51.6. ± 17.1 years and 69% were male. The majority (74%) were receiving ICU-level care at index event. The most frequent comorbidities were chronic pulmonary disease (37%), renal disease (31%), and diabetes (31%) with 69% having a prior hospitalization within 90 days. Thirty-three patients had a positive culture; the most frequent isolate sites were respiratory (33%) and blood (21%). *P. aeruginosa* (n=28) was the most common organism with 61% (n=17/28) considered MDR and an additional 21% (n=6/28) considered XDR. Clinical cure was achieved for 81% of evaluable (n=32) patients. Thirty-day all-cause mortality was 6%, and median (interquartile range) LOS was 38 (53) days.

**CONCLUSION:** Among 35 patients treated with C/T for primarily MDR/XDR *P. aeruginosa* infections, clinical cure was 81%. C/T represents a promising agent for the treatment of *P. aeruginosa* resistant to traditional antipseudomonal agents.

## PEDIATRICS

**450. Opioid-related acute care visits among adolescents receiving medication-assisted treatment** *Kim S. Walker, Pharm.D.*[1], Andrea E. Bonny, MD[2], Erin R. McKnight, MD, MPH[2], Milap C. Nahata, Pharm. D., MS[1]; [1]College of Pharmacy, The Ohio State University, Columbus, OH [2]Department of Pediatrics, Nationwide Children's Hospital, Columbus, OH

**INTRODUCTION:** The rate of opioid-use disorder (OUD) in adolescents and young adults in the US more than doubled between 1991 and 2012. The American Academy of Pediatrics strongly recommended increasing access to medication assisted treatment (MAT) for OUD in this population in 2016 with the acknowledgement that 'rigorous research support' for MAT in adolescents and young adults did not exist.

**RESEARCH QUESTION OR HYPOTHESIS:** The purpose of this study was to evaluate the effect of MAT on the presentation of adolescents to the emergency department (ED), urgent care (UC) or for inpatient admission due to acute opioid-related complaints including overdose, withdrawal, or intoxication, between 2006 and 2016. Our hypothesis was that MAT would reduce the number of presentations to the facility for acute opioid-related complaints during the time period.

**STUDY DESIGN:** Retrospective cohort, single-center

**METHODS:** From 2006 to 2016, all adolescents (aged 10-19 years) who presented with acute opioid-related complaints were referred to the outpatient MAT clinic at the hospital. The primary outcome assessed the difference in the number, proportion, and frequency of visits for acute opioid-related complaints between the MAT and non-MAT cohorts. Secondary analysis assessed the change in acute opioid-related visits within the MAT cohort before and after MAT utilization.

**RESULTS:** 315 patients met the inclusion criteria, with 275 (87.3%) utilizing MAT during the time period. The primary endpoint composite of acute visits to the ED, UC, or inpatient admission for OUD-related complaints occurred in 49 of 176 visits (frequency= 0.178) in the MAT cohort versus 97 of 120 visits in the non-MAT (frequency= 2.425), (Mann-Whitney 0.1119, 95% CI 0.0626-0.1999, p < 0.0001; OR: 0.0915, 95% CI 0.0522-0.1604, p < 0.0001).

**CONCLUSION:** Visits to the ED, UC, and inpatient facility for acute opioid-related complaints was reduced by 90% in adolescents receiving MAT.

**451. Outcomes of staphylococcus aureus infections in critically ill children: do vancomycin trough concentrations matter?** *Nicholas Fusco, Pharm.D., BCPS, BCPPS*, Stacie Yi, Pharm.D. Candidate, Calvin Meaney, Pharm.D., BCPS; Department of Pharmacy Practice, University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY

**INTRODUCTION:** Although data are lacking in children, vancomycin trough concentrations (VTCs) of 15-20 mcg/mL are often empirically targeted when treating *Staphylococcus aureus* infections. Recent pharmacokinetic modeling data in children suggest that sufficient vancomycin exposure occurs when VTCs are 7-10 mcg/mL. Additionally, VTCs >15 mcg/mL have been associated with acute kidney injury (AKI) in children. Therefore, it is important to determine if initial VTCs have an impact on clinical outcomes in children.

**RESEARCH QUESTION OR HYPOTHESIS:** Initial VTCs do not impact clinical outcomes in critically ill children infected with *Staphylococcus aureus*.

**STUDY DESIGN:** Retrospective cohort study.

**METHODS:** Children (≥ 3 months of age) infected with *Staphylococcus aureus*, admitted to the pediatric intensive care unit, were divided into those with initial VTCs <10 mcg/mL, 10 to <15 mcg/mL and ≥15 mcg/mL. The primary composite outcome included: all-cause mortality, fever lasting >48 hours after vancomycin initiation, or positive blood cultures >72 hours after vancomycin initiation. Secondarily, AKI was defined as a 50% increase in serum creatinine from baseline within 48 hours. Descriptive statistics were used to characterize the data with appropriate hypothesis testing performed between VTCs groups. Analysis was completed using SAS v9.4 with alpha=0.05.

**RESULTS:** A total of 38 children were included with initial VTCs of: <10 mcg/mL (n=9; 23.6%); 10 to <15 mcg/mL (n=15; 39.4%); and, ≥15 mcg/mL (n=14; 36.8%). There was no difference in the primary composite outcome between children with VTCs <10 mcg/mL (n=2/6; 33.3%); 10 to <15 mcg/mL (n=2/9; 22.2%); and, ≥15 mcg/mL (n=5/12; 41.7%) (p=0.87). There was no difference in the rate of AKI between children with VTCs <10 mcg/mL (n=4/9; 44.4%); 10 to <15 mcg/mL (n=4/15; 26.7%); and, ≥15 mcg/mL (n=6/13; 46.2%) (p=0.52).

**CONCLUSION:** In this small, retrospective study, initial VTCs did not impact clinical outcomes in critically ill children infected with *Staphylococcus aureus*.

## PHARMACOGENOMICS/ PHARMACOGENETICS

**452. Pharmacogenetic associations to clinical methylphenidate outcomes: a pilot study** *Jacob Brown, Pharm.D., MS*[1], Ida Aka, MS[2], Thierry Chekouo, Ph.D.[3], Sara Van Driest, MD, Ph.D.[4]; [1]Pharmacy Practice and Pharmaceutical Sciences, University of Minnesota College of Pharmacy, Duluth, MN [2]Vanderbilt University Medical Center, Nashville, TN [3]Mathematics and Statistics, University of Calgary, Calgary, AB, Canada [4]School of Medicine, Vanderbilt University, Nashville, TN

**INTRODUCTION:** Methylphenidate is the most commonly prescribed medication for ADHD. Nearly one-third of children prescribed methylphenidate do not respond to treatment, and nearly half discontinue methylphenidate within one year. These treatment failures ostensibly cause preventable adverse effects and delay desired clinical outcomes. If pharmacogenetic associations are validated, testing for variations impacting methylphenidate disposition may assist in improved efficacy.

**RESEARCH QUESTION OR HYPOTHESIS:** To determine the feasibility of a retrospective study testing the hypothesis that variants in COMT and SLC6A2 are associated with clinical outcomes in children treated with methylphenidate.

**STUDY DESIGN:** This was a pilot retrospective pharmacogenetic association study.

**METHODS:** The study used BioVU, Vanderbilt's de-identified electronic health records-based DNA repository. Inclusion criteria were age <18 years at start of methylphenidate treatment for ADHD. Demographic, clinical, and outcome variables were determined by manual review. The primary outcome was adverse effect attributed to methylphenidate, and the secondary outcome was change in dose during the therapeutic course. DNA was sequenced using the Kailos next generation assay. Univariate and multivariate analysis tested for the association of genotypes to outcomes. Firth logistic models were used to reduce the variance of our odds ratio estimates.

**RESULTS:** A total of 25 individuals were included. Although pharmacogenetic variants were not associated with adverse effects, race was identified as a significant predictor (AOR 7.7, p=0.015 Caucasian vs African-American individuals). In the univariate analysis, variants in COMT (rs4680) (p=0.052) and SLC6A2 (rs3785143) (p=0.056) trended toward significance with change in dose. In the multivariate analyses, heterozygotes (C/T) for rs3785143 (SLC6A2) were 11.2 times less likely to require a dose change than C/C homozygotes when adjusting for rs12708954 (SLC6A2). Other demographic variables and SNPs were excluded from the model as they were not significant.

**CONCLUSION:** Pharmacogenetic variation in drug disposition genes may contribute to individual variation in clinical outcomes with methylphenidate.

**453. Functional characterization of the role of sod2 rs4880 in asparaginase-induced hepatotoxicity** *Houda Alachkar, Pharm.D., Ph.D.*[1], Sharon Wu, BS[2], Navin Rana, HSDG[2]; [1]Clinical Pharmacy, University of Southern California School of Pharmacy, USC, Los Angeles, CA [2]USC, Los Angeles, CA

**INTRODUCTION:** Overall survival of adults with acute lymphoblastic leukemia (ALL) is less than 45%. The high rate of asparaginase-related toxicities particularly hepatotoxicity has limited its widespread use in adults. Holding asparaginase treatment when grade 3–4 hepatotoxicity develops (occurs in ~30% of patients), may compromise the antileukemia effect and clinical outcome. Our recent pharmacogenetic studies demonstrated that a genetic variant, rs4880, in *SOD2* , a key mitochondrial enzyme that protects cells against reactive oxygen species (ROS), is associated with asparaginase-induced hepatotoxicity in adults with ALL. Functional studies of rs4880 role are needed to validate its clinical utility and to develop therapeutic approaches that mitigate this toxicity.

**RESEARCH QUESTION OR HYPOTHESIS:** *SOD2* rs4880 is a functional SNP that contributes to asparaginase-induced hepatotoxicity.

**STUDY DESIGN:** Preclinical functional studies

**METHODS:** A panel of liver cell lines were genotyped for rs4880, and transduced with lenti-viral plasmids carrying SOD2-rs4880 C or T-alleles. We assessed ROS in engineered and naive cells at base, post-asparaginase and post-starvation levels. We also assessed ROS levels in human lymphoblastoid cell lines (N=18) according to rs4880 genotypes.

**RESULTS:** Genotyping analysis of liver cell lines resulted in the identification of two CC and five TT and one CT genotypes of rs4880. Total ROS levels were significantly higher for rs4880-CC compared with TT carrying cells at base levels, post-asparaginase and post-starvation (folds: 1.45, P=0.002; 1.3, P=0.01; and 1.7, P<0.001, respectively). We also found higher increase in ROS level post-starvation from base level in HTB52 cells ectopically expressing rs4880-C compared with those that ectopically expressing T allele (2.4-fold, P=0.03). Consistently, lower SOD2 enzymatic activity was observed in Huh7 and HepG2 cells ectopically expressing C vs T (25% and 20% respectively, P<0.01). Initial analysis of total ROS levels in LCLs showed no significant difference between the CC and TT genotypes.

**CONCLUSION:** The rs4880-CC is associated with lower SOD2 enzymatic activity and higher ROS levels.

**454. Concordance between glucose-6-phosphate dehydrogenase (g6pd) genotype and phenotype in pediatric patients with hematologic malignancies** *Katherine M. Robinson, BS*[1], Wenjian Yang, Ph.D.[1], Cyrine E. Haidar, Pharm.D.[1], Jane Hankins, MD, MS[2], Dennis Jay, Ph.D.[3], Nancy Kornegay, MS[1], Jeffrey Rubnitz, MD, Ph.D.[4], Ulrich Broeckel, MD[5], Cheng Cheng, Ph.D.[6], Ching-Hon Pui, MD[4], Sima Jeha, MD[4], Mary V. Relling, Pharm.D.[1]; [1]Department of Pharmaceutical Sciences, St. Jude Children's Research Hospital, Memphis, TN [2]Department of Hematology, St. Jude Children's Research Hospital, Memphis, TN [3]Department of Clinical Chemistry and Laboratory Informatics, St. Jude Children's Research Hospital, Memphis, TN [4]Department of Oncology, St. Jude Children's Research Hospital, Memphis, TN [5]Department of Pediatrics, Medical College of Wisconsin, Milwaukee,

WI [6]Department of Biostatistics, St. Jude Children's Research Hospital, Memphis, TN

**INTRODUCTION:** Although glucose-6-phosphate dehydrogenase deficiency is a long recognized pharmacogenetic trait, phenotypic rather than genotypic tests remain the gold standard for diagnosing G6PD status. G6PD deficiency can cause rasburicase-induced methemoglobinemia.

**RESEARCH QUESTION OR HYPOTHESIS:** We investigated the utility of *G6PD* genotyping in predicting G6PD deficiency in children with hematological malignancies and the association of *G6PD* genotype with rasburicase-induced methemoglobinemia.

**STUDY DESIGN:** This was a retrospective analysis of 990 patients with hematological malignancies treated at St. Jude Children's Research Hospital from 1996-2013

**METHODS:** G6PD activity in erythrocytes was measured using a spectrophotometric assay. Genotype data were available for 645 patients from three genotyping platforms. G6PD status by genotype was classified as deficient, variable, or normal, based on Clinical Pharmacogenetics Implementation Consortium guidelines. Medical records for patients with methemoglobin measurements were reviewed for rasburicase administration.

**RESULTS:** We observed 11 males with WHO Class I-III *G6PD* genotypes, 9 of whom had G6PD deficiency by activity, resulting in an 81.8% positive predictive value in males. The only two males with a Class I-III allele with normal G6PD activity by phenotype had received red cell transfusions prior to the activity assay. *G6PD* genotyping had 39.1% sensitivity to predict G6PD deficiency in males. No females were homozygous for Class I-III alleles and thus none were predicted to be G6PD deficient based on genotype; two of the 12 heterozygous females had deficient G6PD activity. Rasburicase-induced methemoglobinemia occurred in 6 patients, 5 of whom had at least one Class I-III allele, despite two of these having normal G6PD activity.

**CONCLUSION:** A G6PD-deficient genotype indicates a deficient phenotype in patients without transfusions, whereas an apparent wild-type genotype does not necessarily imply a normal phenotype. Although *G6PD* genotyping has limitations, it can be useful for confirming G6PD status and can possibly identify patients at risk for methemoglobinemia with rasburicase, including heterozygous females.

## PSYCHIATRY

**455. The effect of atypical antipsychotics on the skeletal muscle lipidome in bipolar disorder** *Kyle Burghardt, Pharm.D.*[1], Kristen Ward, Pharm.D.[2], Berhane Seyoum, MD, MPH[3], Renu Kowluru, Ph.D.[3], Zhengping Yi, Ph.D.[4]; [1]Eugene Applebaum College of Pharmacy and Health Sciences Department of Pharmacy Practice, Wayne State University, Detroit, MI [2]Clinical Pharmacy Department, College of Pharmacy, University of Michigan, Ann Arbor, MI [3]School of Medicine, Wayne State University, Detroit, MI [4]Eugene Applebaum College of Pharmacy and Health Sciences Department of Pharmaceutical Science, Wayne State University, Detroit, MI

**INTRODUCTION:** The molecular mechanisms by which atypical antipsychotics cause insulin resistance remain poorly understood however, lipid metabolism is thought to play a critical role. Current research has not focused on tissues involved in the development of insulin resistance such as the skeletal muscle.

**RESEARCH QUESTION OR HYPOTHESIS:** Do atypical antipsychotics cause lipids within the skeletal muscle to change and does this correlate with insulin resistance?

**STUDY DESIGN:** Cross-sectional

**METHODS:** Subjects with bipolar disorder, currently on an atypical antipsychotic or mood stabilizer for 3 or more months and without a family history of diabetes underwent a fasting oral glucose tolerance test to calculate insulin sensitivity and a muscle biopsy to analyze total fatty acids, phosphatidylcholines and ceramides. Comparisons of individual lipids were made based on treatment and correlation analyses were performed with insulin sensitivity. False Discover Rate (FDR) corrected q-values < 0.05 were considered statistically significant.

**RESULTS:** Thirty subjects were included. The average age of the subjects was 44.0 $\pm$ 14.0, 59% were female, 65% were Caucasian and 50% were on an atypical antipsychotic. A total of 51 skeletal muscle lipids were analyzed (26 total fatty acids, 11 phosphatidylcholines and 14 ceramides). Subjects on atypical antipsychotics had lower levels of 20 total fatty acids and 6 phosphatidylcholines and higher levels of 13 ceramides (all q<0.05) compared to subjects on mood stabilizers. Additionally, for subjects on atypical antipsychotics, total fatty acids and phosphatidylcholines tended to decrease with insulin resistance while ceramides increased with insulin resistance.

**CONCLUSION:** This work suggests that atypical antipsychotics may influence the skeletal muscle lipidome and that this may correlate with changes in insulin sensitivity caused by the medications. Confirmatory work could lead to future approaches and therapeutics designed to avoid the deleterious effects of these drugs on metabolic tissues such as the skeletal muscle.

## CLINICAL PHARMACY FORUM

## AMBULATORY CARE

**456. Comprehensive medication management provided by clinical pharmacists in a family medicine clinic** *Jarred Prudencio, Pharm.D.*[1], Michelle Kim, Pharm.D.[2]; [1]Pharmacy Practice, The Daniel K. Inouye College of Pharmacy at the University of Hawaii at Hilo, Hilo, HI [2]Pharmacy Practice, The Daniel K. Inouye College of Pharmacy at the University of Hawaii at Hilo, 200 W. Kawili St., HI

**SERVICE OR PROGRAM**: Comprehensive medication management (CMM) is provided by two pharmacists at a family medicine residency clinic. Patients are referred to a pharmacist by a physician and scheduled for a 40-minute appointment. During the visit, the pharmacist provides a complete medication reconciliation, patient education, and optimization of medication regimens through a collaborative practice agreement which allows ordering of non-controlled medications and laboratory tests.

**JUSTIFICATION/DOCUMENTATION:** Based on retrospective review of documented pharmacist visits in 2017, a total of 115 patients were provided CMM through 357 visits. Most were autonomous pharmacist visits, but 15.97% of visits included a nurse practitioner. A medication discrepancy was found at 19.33% of CMM visits, with a total of 182 discrepancies found. Most patients had diabetes (73.04%), but pharmacists addressed the patient's entire regimen, a standard in CMM practices. Average A1c change was -1.42% and systolic blood pressure change was -13.02 mmHg. Medications were adjusted at 37.56% and labs were ordered at 31.37% of the visits. Other immeasurable duties of the service include consults from other providers in the clinic, warfarin management, and assistance with medication access.

**ADAPTABILITY:** These pharmacists are residency-trained and hold faculty positions at a college of pharmacy. The service allows pharmacists to work directly in a clinic as a valuable part of the interprofessional patient care team. Other ambulatory care pharmacists would be able to implement a service similar to this in any family medicine clinic.

**SIGNIFICANCE:** This adds to the evidence that pharmacist-provided CMM services integrated in a family medicine clinic can improve patient outcomes. By having a progressive pharmacy service integrated in a medical residency, residents grow accustomed to pharmacist-provided CMM and may desire to continue to work with ambulatory care pharmacists in their future practices.

**457. Primary care initiative (PCI) – collaborative chronic disease management with pharmacist-led visits** Daniel Wilk, Pharm.D., *Julie Bartell, Pharm.D.*; Pharmacotherapy, SSM-Monroe Clinic, Monroe, WI

**SERVICE OR PROGRAM:** SSM-Monroe Clinic is a rural healthcare system located in Southern Wisconsin. We implemented the Primary Care Initiative (PCI) to improve patient access to primary care physicians (PCPs) by transferring appointments for chronic disease management from physicians to Pharmacotherapists. Patients with diabetes, hypertension, hyperlipidemia, thyroid disorder, and uncomplicated depression/anxiety are eligible. Pharmacotherapists utilize collaborative practice agreements (CPAs) to adjust medications, order labs, and follow-up with the patient appropriately.

**JUSTIFICATION/DOCUMENTATION:** The Robert Graham Center projects PCP demand to be higher for Wisconsin compared to the rest of the Midwest, correlating to a shortage of 942 FTEs by 2030. Our service mitigates the PCP shortage, which is further exacerbated in rural communities like Green County, Wisconsin. Success will be measured by a change in time-to-third-available appointment for enrolled PCPs, change in emergency department utilization for primary care issues, improved patient outcomes, patient and provider satisfaction, and changes in revenue.

**ADAPTABILITY:** This initiative can be implemented by other organizations where pharmacists use CPAs. Our initiative had a six-month service development phase followed by a twelve-month service implementation phase. This can be extrapolated to any ambulatory care practice. The shortage of PCPs is a concern nationwide, and thus our initiative is not restricted to rural communities.

**SIGNIFICANCE:** Chronic disease management within primary care is a niche where pharmacists can add significant value to the healthcare team. Pharmacists practicing at the top of their license benefits the physician, patient, community and organization. The implementation phase of our initiative started in January 2018 and we currently have ten of 17 PCPs enrolled in the program. Our financial model shows that as this initiative expands, Pharmacotherapists can accommodate 75 PCI patients per week, resulting in an additional $862,806 in revenue and $411,418 annual profit. Data for health outcomes, access outcomes, and financial outcomes will be collected quarterly, beginning in March 2018.

**458. 2018 update of initiatives of the ACCP ambulatory care practice and research network (PRN) – focus on member billing and reimbursement of clinical pharmacy services** *James C. Lee, Pharm.D., BCACP*[1], Sweta M. Patel, Pharm.D., BCPS[2], Ginelle A. Bryant, Pharm. D., BCPS[3], Kelly A. Lempicki, Pharm.D., BCPS[4]; [1]University of Illinois at Chicago College of Pharmacy, Chicago, IL [2]Department of Pharmacy Practice, Mercer University College of Pharmacy, Atlanta, GA [3]Drake University College of Pharmacy and Health Sciences, Des Moines, IA [4]Department of Pharmacy Practice, Midwestern University Chicago College of Pharmacy, Downers Grove, IL

**SERVICE OR PROGRAM**: The ACCP Ambulatory Care PRN is an active body of clinical pharmacists contributing to ACCP and the PRN through leadership and committee involvement while also serving in ambulatory care pharmacy. Members are regularly queried to assess the impact of clinical practice and administrative issues which may significantly affect ambulatory care clinical pharmacy services.

**JUSTIFICATION/DOCUMENTATION:** To evaluate Ambulatory Care PRN practitioner knowledge, confidence, and utilization of billing and reimbursement mechanisms for their clinical services, an electronic survey was developed to characterize year-to-year progress of PRN practitioners' contributions towards establishing financial sustainability for clinical pharmacy services.

**ADAPTABILITY:** Data obtained through this survey and web-based communications have been compared to previous years.

**SIGNIFICANCE:** The Ambulatory Care PRN consists of approximately 2000 members. With a growing number of PRN practitioner members providing clinical services in an increasing mix of practice settings, 52% of respondents (n=132) reported actual billing for services provided. The most frequent billing mechanisms utilized for direct patient care included incident-to-physician billing using evaluation/management service codes, facility fees, and medication therapy management codes. Conversely, the percentage of reimbursed clinical services billed was below 50%. The majority of payment sources were Medicare and commercial insurances, with fee-for-service being the most frequently reported billing mechanism. PRN practitioners continue to face numerous barriers related to billing for clinical services, including but not limited to lack of need and/or incentive to generate revenue, lack of support from legislation and/or health systems, a focus on cost

savings, and lack of billing and reimbursement knowledge. In an effort to reduce these barriers, the Ambulatory Care PRN continues to develop programming related to billing and reimbursement practices in ambulatory care pharmacy. This includes developing, implementing, and sustaining ideal models, as well as promoting legislation advocating the role of pharmacists as clinical providers.

**459. 2018 updates on the accomplishments and initiatives of the accp ambulatory care practice and research network (PRN)** *James C. Lee, Pharm.D., BCACP*[1], Kelly A. Lempicki, Pharm.D., BCPS[2], Ginelle A. Bryant, Pharm.D., BCPS[3], Sweta M. Patel, Pharm.D., BCPS[4]; [1]University of Illinois at Chicago College of Pharmacy, Chicago, IL [2]Department of Pharmacy Practice, Midwestern University Chicago College of Pharmacy, Downers Grove, IL [3]Drake University College of Pharmacy and Health Sciences, Des Moines, IA [4]Department of Pharmacy, Grady Health System, Atlanta, GA

**SERVICE OR PROGRAM:** The Ambulatory Care PRN is an active body of clinical pharmacists contributing to ACCP and the PRN through leadership and committee involvement while also serving in ambulatory care pharmacy. Members are currently queried biannually regarding individual professional accomplishments such as promotions, awards, funding, and scholarly activities.

**JUSTIFICATION/DOCUMENTATION:** To evaluate the initiatives and achievements of the ACCP Ambulatory Care PRN and its membership, an electronic survey was updated and disseminated to characterize the year-to-year progress of member contributions to clinical practice, service, teaching, and research.

**ADAPTABILITY:** Data obtained through this survey and web-based communications have been compared to previous years. A record of contributions and accomplishments are continuously documented and reported via the *ACCP PRN Report*.

**SIGNIFICANCE:** The Ambulatory Care PRN consists of approximately 2000 members, with practice settings and services provided by the PRN membership continuing to diversify. PRN committees continue to promote initiatives related to advocacy, practice support, and PRN membership outreach and networking. Advocacy efforts include a letter writing campaign and further development of the Advocacy Toolkit. Support for member participation in professional, scholarly, and clinical development continues through increased PRN-sponsored grant funding. Initiatives aimed at expanding PRN collaboration and knowledge were advanced with the development of PRN subgroups for members with similar practice areas or areas of interest, initiation of a resident journal club, expanded use of social media and other technology platforms, and coordination of networking events at major pharmacy organization meetings. The Ambulatory Care PRN continues to show positive growth in membership depth, committee contributions, and membership support. The opportunities provided and accomplishments achieved through the PRN remain of high value to the PRN and College. The PRN continues to strive to provide a wide range of advocacy, educational, and innovation opportunities with the objective of advancing pharmacist development, ambulatory care clinical practice, and patient care provision.

**460. Impact of clinical pharmacists as a part of an interdisciplinary team approach on controlled substance prescribing in a primary care setting** Brooklyn Nelson, Pharm.D.[1], Jennifer Trotter, Pharm.D.[2], *Elicia White, Pharm.D.*[3], Emily Russell, Pharm.D.[4]; [1]Patient Centered Medical Home, Mountain States Medical Group, Johnson City, TN [2]Patient Centered Medical Home, Mountain States Medical Group, Abingdon, VA [3]Patient Centered Medical Home, Mountain States Medical Group, Kingsport, TN [4]Department of Pharmacy Practice, East Tennessee State University Bill Gatton College of Pharmacy, Johnson City, TN

**SERVICE OR PROGRAM:** Three clinical pharmacists currently embedded in physician offices in Northeast Tennessee and Southwest Virginia have been actively participating in closer monitoring and safer prescribing of controlled substances since January 2017. They currently provide recommendations for urine drug screen monitoring, evaluation of the Prescription Monitoring Database, naloxone prescribing and counseling, tapering protocols, and recommendations for non-opioid medications for chronic pain.

**JUSTIFICATION/DOCUMENTATION:** Per the Department of Health, Tennessee had the second highest per capita prescription rate for opioids in the United States in 2015 with an increase in unintentional overdose deaths of more than 250% since 2001. Increasingly, patients seek advice from primary care providers for treatment of chronic pain. For these reasons, an interdisciplinary approach in primary care may be beneficial for reducing unnecessary opioid prescriptions, providing necessary provider and patient education regarding the risks of controlled substances, and providing guidance on interpretation of urine drug screens, tapering protocols, naloxone administration, and non-opioid medications.

**ADAPTABILITY:** This pilot program consists of three residency-trained ambulatory care clinical pharmacists along with pharmacy students completing advanced pharmacy practice experience rotations. While five primary care offices are currently being served by three clinical pharmacists, it is important to note that the pharmacists' roles are still focused in comprehensive primary care management, with safer pain management interventions comprising only part of their role. Therefore, one clinical pharmacist working exclusively on this initiative could potentially serve three to four practices.

**SIGNIFICANCE:** Preliminary estimates of opioid reduction include the elimination of the equivalent of 500,000 hydrocodone/acetaminophen 10/325 mg tablets from being written in prescriptions over the following year. Additionally, urine drug screen adherence has improved from 8% to 89% in patients receiving more than 90 morphine miliequivalents per day. Naloxone prescriptions and counseling have also increased dramatically since initiation of the pilot.

**461E. Outcomes of a primary care comprehensive medication management (CMM) implementation project at an academic health system: lessons learned from involvement in a national learning collaborative** Mary Kuzel, Pharm.D.[1], Kyle Turner, Pharm.D.[2], Kelsee Wride, Pharm.D.[3], *Jenni Buu, Pharm.D.*[4], Golden Berrett, Pharm.D.[4]; [1]Pharmacy Primary Care Services, University of Utah Health, Midvale,

UT [2]Department of Pharmacotherapy, University of Utah College of Pharmacy, Salt Lake City, UT [3]Pharmacy Primary Care Services, University of Utah Health, South Jordan, UT [4]Pharmacy Primary Care Services, University of Utah Health, Salt Lake City, UT
Presented at American Society of Health-System Pharmacists Summer Meetings Ambulatory Care Conference, Denver, CO, June 2-6, 2018.

**462. Ambulatory and transitions of care management of anticoagulation therapy utilizing a pharmacist-registered nurse model** *Donald Brown, Pharm.D., BCACP*, Steve Sytsma, Pharm.D., BCPS, Candace Minter, Pharm.D., BCACP, Mary Morin, RN, MSN, BSN, NEA-BC, RN-BC; Sentara Healthcare System – Sentara Medical Group, Norfolk, VA

**SERVICE OR PROGRAM:** The Sentara Anticoagulation Services Clinic (SASC) is a comprehensive, standardized, and evidenced-based anticoagulation management service within a large integrated healthcare system in the southeast United States. Developed in 2014, this clinic model was formed in collaboration with Clinical Pharmacy Specialists (CPS), referring Providers, and Registered Nurses (RN) in order to improve the quality of anticoagulant therapy and stewardship for ambulatory patients.

**JUSTIFICATION/DOCUMENTATION:** The SASC pharmacist-RN anticoagulation management clinic has grown since inception. When first conceived in first-quarter 2014, SASC had more than 17,000 patient encounters managed by 15 in-person clinic RNs at 11 satellite clinics; two full-time (FTE) CPS were consulted on ~1,800 patients (11% consultation rate). During this initial period, the overall time in therapeutic range (TTR) for the 11 clinics was ~65%. As of fourth-quarter 2017, the number of clinics has expanded to 22 locations throughout Virginia and northeast North Carolina and a telephonic/virtual RN clinic service has been added. The now 35 clinic RNs had more than 92,000 patient encounters; with the 3.5 FTE CPS being consulted ~30,000 times (~32% consultation rate). Current TTR has improved to ~67% for all patient encounters in 2017.

**ADAPTABILITY:** This model utilizes in-person and telephonic RNs to assess patients. The centrally located CPS function as consultants on patients for whom the protocols do not apply. The SASC pharmacist-RN anticoagulation management model could be adapted by other large healthcare systems wishing to reach large numbers of patients over a large geographical area. Our group has developed a transition of care model to identify and review patients discharged from hospital on warfarin in order to improve medication safety.

**SIGNIFICANCE**: Unique aspects of SASC include centralized, telephonic/virtual pharmacists, and a growth model that is adaptable to a large geographic area and allows for both pharmacists and RNs to practice at the top of their respective licenses.

**463. Development and justification of a pharmacist-led collaborative hypertension management service in a primary care clinic** *Erin Carson, Pharm.D.*; University of Illinois-Chicago College of Pharmacy, Rockford, IL

**SERVICE OR PROGRAM:** In a primary care clinic associated with a health system in Rockford, IL without previous clinical pharmacy services, a collaborative practice agreement (CPA) was developed between primary care providers (PCP) and a pharmacist to provide comprehensive services to patients with uncontrolled hypertension. In addition to providing comprehensive education and close follow-up, the CPA allows pharmacists, after physician referral, to independently initiate, discontinue, and titrate antihypertensive medications. Clinic blood pressure readings and home monitoring with validated machines are used to adjust medications. Patients are followed monthly until adequate control is achieved, then peripherally thereafter. Services are reinstated if elevated blood pressures are subsequently identified.

**JUSTIFICATION/DOCUMENTATION:** Over 1/3 of Americans have hypertension and over 50% are uncontrolled. Team-based hypertension services including a pharmacist have been shown to improve blood pressure control compared to traditional hypertension management. Accessibility of an integrated pharmacist in a primary care clinic allows for close follow-up with patients and collaboration with the primary care team. The goal of the service described is to maintain a percentage of patients with controlled hypertension above the Healthcare Effectiveness Data and Information Set (HEDIS) 90$^{th}$ percentile.

**ADAPTABILITY:** A pharmacist-led hypertension service is implementable in any primary care clinic as long as a written CPA is developed and agreed upon by all involved parties.

**SIGNIFICANCE:** Managed care metrics are a compelling way to justify new services. After nine months, the percentage of patients receiving comprehensive hypertension services with controlled hypertension was 68%. This is below the HEDIS 90$^{th}$ percentile, currently 74.07%, but improved from baseline. The healthcare system's goal of improving managed care metrics allowed for development of clinical pharmacy services in a facility previously without pharmacy presence. This new service demonstrates pharmacist accessibility and collaboration with the primary care team, advancing clinical pharmacy practice.

**464. Captain james a. lovell federal health care center clinical pharmacist specialist new patient intake clinic** *Megan Grischeau, Pharm.D., BCACP*[1], Ann Livorsi, Pharm.D., BCACP[2], Jessica Johnson, Pharm.D., BCACP[3]; [1]Pharmacy, Captan James A. Lovell Federal Health Care Center, North Chicago, IL [2]Department of Pharmacy, Captain James A. Lovell Federal Health Care Center, North Chicago, IL [3]Pharmacy, Captain James A. Lovell Federal Health Care Center, North Chicago, IL

**SERVICE OR PROGRAM:** Captain James A. Lovell Federal Health Care Center (FHCC) is the first joint Veteran's Health Administration (VHA) and Department of Defense venture. Prior to project implementation a patient's new Primary Care Provider (PCP) and designated team staff (i.e. LPN, RN) were responsible for completing medication reconciliation, verifying allergies, past medical history, ordering medications and labs during the initial visit. The New Patient Intake (NPI) Clinic's purpose is to increase time for PC staff to address

other pertinent issues. As part of the NPI process, upon patient registration, the scheduler makes an appointment with the Clinical Pharmacy Specialist (CPS) prior to initial visit. During this appointment, the patient is introduced to FHCC prescription processes and the VHA formulary. Clinical recommendations are made to the PCP regarding formulary conversions and a full medication reconciliation is performed.

**JUSTIFICATION/DOCUMENTATION:** Other VHA pilot sites found the NPI process consumed about 20 minutes of the PCP's allotted time during that initial visit. The NPI clinic standardized and streamlined this process while enhancing the overall patient experience. Furthermore, as labs are ordered and resulted prior to the appointment, the additional time required to contact patients after the visit is saved.

**ADAPTABILITY:** The CBOC and Women's Health CPS's were the first to implement this project. Afterwards, the NPI project will be implemented within the FHCC Patient Aligned Care Teams (PACT). This process also serves as a mode of CPS-guided or patient self-referral for disease management.

**SIGNIFICANCE:** Our time study estimates each NPI appointment translates to 45 minutes saved by the PC clinic staff. In the first seven months of the project an estimated 82 hours were saved in contacting 109 patients between the four pilot sites. Ongoing reflection will occur to ensure the intended goals of the NPI clinic are met.

**465. Implementation of the CDC'S diabetes prevention program in an employer-based primary care clinic** Holly Gurgle, Pharm.D., BCACP, CDE, *Christopher Khong, BS, Pharm.D. Candidate Class of 2019*, Alisyn May, Pharm.D., BCACP, CDE; Department of Pharmacotherapy, University of Utah College of Pharmacy, Salt Lake City, UT

**SERVICE OR PROGRAM**: Among US adults, 36.5% are obese and 33.9% have pre-diabetes. Without intervention, many will develop diabetes or cardiovascular disease, at great cost to employers or other health payers. The CDC National Diabetes Prevention Program (DPP) is an evidence-based, year-long lifestyle change program which aims to support participants in reducing their risk of diabetes and losing 5% body weight. In January 2017, ARUP Laboratories (a self-insured employer) implemented the DPP. The program was coordinated by clinical pharmacists but was a collaborative effort including dietitians, wellness coaches, medical assistants, and students. **JUSTIFICATION/DOCUMENTATION:** Using a health risk assessment, 645 employees or dependents with BMI ≥ 30 kg/m$^2$ and HbA1c 5.7-6.4% (not previously diagnosed with diabetes) were identified and invited to participate. Twenty-four, 1-hour group sessions were held for the 25 individuals that elected to participate. On average, participants attended 17.9 +/- 5.0 sessions, recorded 224.6 +/- 128.1 minutes per week of physical activity, and lost 5.1% body weight during the year. Compared to baseline, at one year participants also reduced their average systolic blood pressure (124.3 +/- 10.46 vs. 118.0 +/- 12.7 mmHg; p=0.014), LDL-C (109.6 +/- 30.2 vs. 97.9 +/- 28.6; p=0.002), and HbA1c (5.9% +/- 0.3 vs. 5.7% +/- 0.2; p<0.001). Participants indicated a high level of satisfaction with the DPP and 93.8% reported they would recommend the program to a friend or family member.

**ADAPTABILITY:** Clinical pharmacists in ambulatory, managed care, or employer-based settings are uniquely positioned to identify eligible individuals and implement a DPP. The CDC provides DPP curriculum and support for organizations at no cost, including an online cost effectiveness calculator. Funding may be available through local health departments to support implementation.

**SIGNIFICANCE:** Increasingly employer-sponsored, Medicare, and Medicaid plans offer DPP as a covered benefit. Implementation of DPP can generate revenue, reduce health costs, and improve patient outcomes.

**466. Development and implementation of a clinical pharmacist-led ambulatory blood pressure monitoring service in a primary care medical home** *Abby Frye, Pharm.D.*; Providence Medical Group, Portland, OR

**SERVICE OR PROGRAM:** The clinical pharmacist-led ambulatory blood pressure monitoring (ABPM) service allows primary care providers to easily access ABPM without a potentially time-consuming and costly referral to a specialist. Patients who could benefit from ABPM are identified by their primary care provider (PCP) and then scheduled with the clinical pharmacist. After the patient returns the monitor, the clinical pharmacist evaluates the report and provides related recommendations to the PCP. The ABPM service was initiated with assistance from a $3000 grant from the Portland InterHospital Physicians Association.**JUSTIFICATION/DOCUMENTATION:** ABPM is supported by a wealth of evidence and is recommended by several national and international guidelines. However, prior to implementation of the ABPM service, PCPs found it difficult to access this valuable tool. Within the first 10 months of implementation, 39 patients completed an ABPM session. Reasons for referral included evaluation of a potential white coat effect, evaluation of reported hypotension, clarification or confirmation of a new diagnosis, and to allow for better or more complete assessment of a patient's current blood pressure control. The majority [87% (34/39)] of the clinical pharmacist's recommendations were implemented by the PCP, and at follow-up, the majority [71% (17/24)] of patients whose ABPM results were consistent with sustained or masked hypertension were now at goal.

**ADAPTABILITY:** A clinical pharmacist-led ABPM service could be implemented at primary care clinics throughout the country. It does not require any additional certification or credentialing, nor does it require a pre-existing collaborative practice agreement; however, proficiency in hypertension is necessary. While nurses and medical assistants could perform some of the associated tasks, clinical pharmacists provide added value based on their expertise and ability to make drug-therapy recommendations.

**SIGNIFICANCE:** ABPM is an opportunity for clinical pharmacists to provide a valuable service that can not only improve patient access but also optimize hypertension control in high risk patients.

**467E. Role of the ambulatory care clinical pharmacist in management of a refugee patient population at the University of Virginia International Family Medicine Clinic** *Kristi Higgins, Pharm.D.*[1], Jeffrey Tingen, Pharm.D., MBA, BCPS, BCACP, CDE[2]; [1]Department of

Pharmacy, University of Virginia Health System, Charlottesville, VA [2]Department of Family Medicine, University of Virginia Health System, Charlottesville, VA
Presented at the North American Refugee Health Conference, Portland, OR, June 6-9, 2018

**468. An electronic pharmacotherapy consult service to improve provider access to clinical pharmacist practitioners in the primary care setting and evaluating the impact of the services on providers and patient care** *Nancy J Lee, Pharm.D., BCPS, CDE*[1], KyAnn Wisse, Pharm. D., BCACP[2], Amanda Guild, Pharm.D., BCACP[2], Elizabeth Marn, Pharm.D., BCACP[2], Cyndy Clegg, BS Pharm, MHA, FASHP[3]; [1]Swedish Medical Group, Issaquah, WA [2]Swedish Medical Group, Seattle, WA [3]Swedish Medical Center, Edmonds, WA

**SERVICE OR PROGRAM:** In 2015, Swedish Medical Group incorporated 5 clinical pharmacist practitioners (CPPs) into 5 of 26 primary care clinics. Value of a CPP embedded in the clinic was evident after the first year with improved chronic disease outcomes. Physicians in clinics without embedded CPPs were requesting CPPs but financial constraints made it challenging to hire additional practitioners. In order to meet the need to have access to CPPs, an electronic pharmacotherapy consult service was developed and implemented using our electronic medical record system (EMR, name EPIC).

The CPP team created an in-basket pool starting in July 2016 for primary care providers to send questions regarding drug therapies. In late 2017 and early 2018, with input from our physician champion and regional medical directors, the in-basket pool was changed to an "e-consult" platform. The new platform allows CPP recommendations to be part of a patient's chart. Each CPP answers questions 1-day per week while managing their home clinic patient care activities.

**JUSTIFICATION/DOCUMENTATION:** From July 2016 to May 2018, we received over 400 drug therapy questions from 19 clinics without embedded CPP presence. Provider acceptance and implementation of recommendations was 97% with 65% considered of high impact to patient care. An average of 30 minutes was spent researching and answering questions. Top 3 categories of questions received were: chronic disease, med review for side effects, and interactions.

**ADAPTABILITY:** Our e-consult service could be adopted by other CPP programs with EMR to improve provider access to CPPs in the primary care setting.

**SIGNIFICANCE:** E-consult service provided by CPPs is viewed as more than just a drug information service as shown by the type of questions received, high utilization in clinics without embedded CPPs, and acceptance of recommendations. Time saved by providers could also be used towards increasing panel size while optimizing drug therapies and reducing med-related harms.

**469. Implementation and integration of clinical pharmacy psychiatric services at a primary care clinic** Nikolas Kovacich, Pharm.D. Candidate, Emily Kosirog, Pharm.D. and *Benjamin Chavez, Pharm.D.*; Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

**SERVICE OR PROGRAM:** Clinical pharmacy services already existed for multiple chronic disease states at this federally qualified health center (FQHC). To further expand chronic disease services and meet a growing need, collaborative practice agreements were developed allowing pharmacists to initiate, change, or discontinue medications for depression, anxiety, and bipolar disorder. Pharmacists were also available to primary care providers (PCPs) and psychologists for psychiatric medication consults. This service was run by two board-certified clinical pharmacists, two post-graduate-year-2 ambulatory care residents, and pharmacy students.

**JUSTIFICATION/DOCUMENTATION:** Although this clinic has many psychologists, patients had a difficult time accessing psychiatric medication management services. Prior to this service, patients were referred to outside psychiatrists, a process which often took months. This pharmacy service increases access and allows patients to receive psychiatric care and medical care in the same setting. Data from a 12-month time period was collected, during which pharmacists completed 294 consults and 102 visits. A breakdown of interventions made through consults and visits will be provided. A survey of PCPs (n=13) revealed that all respondents felt clinical pharmacists had helped them feel more comfortable prescribing psychotropic medications (9 strongly agreed, 4 agreed).

**ADAPTABILITY:** This service has been in place for 2 years and has been well received by other members of the healthcare team, as evidenced by both the provider satisfaction survey results and the large volume of referrals and consults. This model can be implemented in outpatient clinics where clinical pharmacists provide pharmaceutical care and there is a need to increase access to psychiatric medication management.

**SIGNIFICANCE:** This is a replicable, innovative service aimed at improving access to care for patients seeking psychiatric treatment in a primary care FQHC setting. It further advances the role of pharmacists, pharmacy residents, and students providing comprehensive care in the primary care setting.

**470. Expanding clinical service of anticoagulation pharmacists to diabetes medication management** *Ashley Van Allen, Pharm.D.*[1], Leanna Davis, Pharm.D.[2], Jay Wirawan, Pharm.D.[3]; [1]Pharmacy, MultiCare, Auburn, WA [2]Diabetes Education, MultiCare, Puyallup, WA [3]Pharmacy, MultiCare, Tacoma, WA

**SERVICE OR PROGRAM:** MultiCare Health System operates four outpatient pharmacist-managed Anticoagulation Clinics (AC) in Washington State. The pharmacists previously worked under a collaborative practice agreement (CPA) which focused solely on warfarin management. Recognizing the existing multiple chronic disease states in anticoagulated patients, a referral-based diabetes medication management service was added. Pharmacists work closely with patients to design a medication regimen to improve glycemic control, with frequent follow-up and increased access for patients.

**JUSTIFICATION/DOCUMENTATION:** Due to the complexity of diabetes medications and labor-intensive management, this prompted discussions about expanding clinical services at the AC. In addition, healthcare in the United States (US) is evolving from fee-to-service to value base payments. The Healthcare Effectiveness Data and Information Set (HEDIS), one of the most widely used sets of healthcare performance measure in the US, has multiple diabetes related measures. The prominent focus of diabetes management in HEDIS was a compelling factor in choosing to expand to this disease state. Due to the AC pharmacists' excellent clinical and safety data with warfarin, it was felt this could be extrapolated in achievement of HEDIS diabetes measures.

**ADAPTABILITY:** Expanding the pharmacists' ability to provide diabetes management consisted of creating a new CPA and additional training. Training involved pre-readings, didactic sessions, and shadowing a pharmacist certified diabetes educator (CDE). Training focused on clinical competencies as well as workflow and documentation.

**SIGNIFICANCE:** AC pharmacists can provide diabetes management to improve patient access to diabetes care and achieve HEDIS measures. In 2017, the pharmacists managed 75 diabetes patients. Over 40% of these patients had an A1c>9% when initially referred to the pharmacist. At the most recent follow-up or last appointment before referred back to their provider, only 9% had an A1c>9% and 76% had an A1c<8%.

**471. Impact of pharmacist intervention on patients meeting target statin doses in clinical ASCVD** *Amanda Guild, Pharm.D., BCACP*[1], Virginia Skipper, Pharm.D., BCACP[2], Elizabeth Marn, Pharm.D., BCACP[1], Nancy J Lee, Pharm.D., BCPS, CDE[3], KyAnn Wisse, Pharm.D., BCACP[1], Cyndy Clegg, BS Pharm, MHA, FASHP[4]; [1]Swedish Medical Group, Seattle, WA [2]Seattle, WA [3]Swedish Medical Group, Issaquah, WA [4]Swedish Medical Center, Edmonds, WA

**SERVICE OR PROGRAM:** In 2016 Swedish Medical Group clinical pharmacist practitioners (CPP) worked to meet a system goal of ensuring patients with clinical atherosclerotic cardiovascular disease (ASCVD) were on moderate-to-high intensity statin therapy. To achieve this goal pharmacists reviewed clinic-specific reports from May to October 2016, detailing patients with ASCVD not on appropriate statin dose, and then worked with providers and patients to ensure proper therapy was attained.

**JUSTIFICATION/DOCUMENTATION:** Appropriate statin therapy for clinical ASCVD reduction is a measure through the National Committee for Quality Assurance (NCQA) Healthcare Effectiveness Data and Information Set (HEDIS), and is important because cardiovascular disease is the leading cause of death in the United States. Swedish Medical Group adapted the HEDIS measure to ensure that our patients with clinical ASCVD were on target therapy doses. Our measure of success for this initiative was seeing improvement in percent of patients meeting the metric. Two clinics with a pharmacist saw a larger improvement in metric percentages during the initiative vs one clinic without a pharmacist (3 and 7.9% improvement vs 0.3% improvement, respectively).

**ADAPTABILITY:** Our workflow and initiative is adaptable by other primary care clinics supported by CPPs under a collaborative drug therapy agreement (CDTA) with the goal to improve HEDIS outcomes specific to secondary ASCVD prevention. An electronic health record with the ability to run disease-state specific reports would be necessary.

**SIGNIFICANCE:** Intensive statin dosing in high-risk patients with clinical ASCVD is important for risk-reduction. It is not uncommon for therapy to be initiated and kept at lower-than-recommended dose, or for patients to claim intolerance without trial of multiple statins or various dosing strategies. Ambulatory pharmacists have the therapeutic knowledge to educate and ensure patients receive appropriate statin therapy to improve outcomes.

**472. Provider status and reimbursement for clinical pharmacist services in primary care: a pilot study** *Elizabeth Marn, Pharm.D., BCACP*[1], Amanda Guild, Pharm.D., BCACP[1], Nancy J Lee, Pharm.D., BCPS, CDE[2], KyAnn Wisse, Pharm.D., BCACP[1], Cyndy Clegg, BS Pharm, MHA, FASHP[3]; [1]Swedish Medical Group, Seattle, WA [2]Swedish Medical Group, Issaquah, WA [3]Swedish Medical Center, Edmonds, WA

**SERVICE OR PROGRAM:** In response to recent Washington state legislation (SB 5557) that requires commercial insurance plans to recognize pharmacists as providers, Swedish Medical Group developed a pilot project to assess the impact of billing for pharmacy services in a primary care clinic. The bill does not require federal insurance (Medicare/Medicaid/TRICARE) to recognize pharmacists as providers, therefore a billing matrix was developed to provide guidance on how to bill for commercially and federally insured patients. Patient visits with the clinic pharmacist were billed to insurance either as an "incident-to" visit under the referring provider's name (Current Procedural Terminology (CPT) code 99211; for government payers) or as a "pharmacist as provider" visit (CPT codes 99211-99215; for commercial payers). Metrics assessed during this pilot included reimbursement received as well as patient satisfaction.

**JUSTIFICATION/DOCUMENTATION:** In addition to expanding the pharmacists' role in patient care, billing for pharmacist-provided clinical services allows opportunities for revenue generation in today's financially vulnerable healthcare environment. During the three-month pilot, 72 office visits were completed. Of these visits, 46% were commercially insured patients and 54% were state or federally funded. Initial reimbursement data for 60 of the 72 visits revealed a fully adjudicated reimbursement rate of 57.1% and $6,499 in generated revenue. The patient satisfaction survey demonstrated high patient satisfaction with an average rating of 4.92 on a five point Likert scale.

**ADAPTABILITY:** This billing model could be applied to ambulatory care pharmacists working in a clinic setting. While revenue generation opportunities would be greater in states that recognize pharmacists as providers, the structure of this billing model could be applied to an ambulatory care practice in any setting.

**SIGNIFICANCE:** As pharmacist provider status becomes more commonplace in individual states and eventually at the federal level, this

billing pilot demonstrates the ability to generate revenue for pharmacist-provided clinical services in a primary care setting.

**473. Medication refill authorization pilot to support primary care clinics in a community health system** *Cindy Brasher, Pharm.D., MS, BCPS*[1], Jerod Braschler, Pharm.D., MS[2], Lorna Doucette, BS[3]; [1]Inpatient Pharmacy, Mission Hospital, Asheville, NC [2]Ambulatory Care Pharmacy Department, Mission Hospital, Asheville, NC [3]Pharmacy, Mission Hospital, Asheville, NC

**SERVICE OR PROGRAM:** A Medication Refill Authorization pilot began as a potential solution to a root cause analysis of a system-wide problem of primary care provider burnout due in part by the number of medication refill requests coming into their electronic medical record (EMR) inboxes. A collaborative team of physicians, nurses, practice and clinical managers, informaticists, and pharmacists came together to develop a centralized remote service to funnel all medication refill requests away from the providers and into a protocol managed by a pharmacist and two pharmacy technicians. The scope included all non-controlled substance medications being requested to refill and involved two primary care clinics in Mission Health System.

**JUSTIFICATION/DOCUMENTATION:** An automated decision support tool was used to develop an action plan as well as communicate to providers in the EMR. This tool acted in place of a smart form that used crosswalks of medications and disease states along with laboratory values and visit dates to create a complex algorithm designed to remove memory steps and allow for more clinical decision making.

Results from the 9 days included the refill team taking care of the following: 580 medication refill requests, 405 patients, 116 clinical follow-up visits scheduled, 74 laboratory orders generated, and 15 significant clinical interventions identified.

**ADAPTABILITY:** The concept of a centralized-pharmacy led refill service is relatively new in the healthcare arena with only a handful of health systems in the country establishing such services.

**SIGNIFICANCE:** After 9 days of operation servicing the two primary care clinics, the pilot evaluated results and developed a business plan for permanent service implementation. The benefits from the refill pilot were both clinically and financially successful enough to create a permanent refill team of 2 pharmacists and 4 technicians.

**474. Development and implementation of a clinical pharmacy intervention to improve five-star quality ratings for osteoporosis management in women who had a fracture** *KyAnn Wisse, Pharm.D., BCACP*[1], Nancy J Lee, Pharm.D., BCPS, CDE[2], Amanda Guild, Pharm.D., BCACP[1], Elizabeth Marn, Pharm.D., BCACP[1], Cyndy Clegg, BS Pharm, MHA, FASHP[3]; [1]Swedish Medical Group, Seattle, WA [2]Swedish Medical Group, Issaquah, WA [3]Swedish Medical Center, Edmonds, WA

**SERVICE OR PROGRAM:** The Centers for Medicare and Medicaid Services (CMS) use five-star quality ratings to rank Medicare Advantage plans with higher ratings corresponding to higher quality. One of the evaluated measures looked at women who suffered a fracture and who required a dual-energy x-ray absorptiometry (DEXA) or medication to treat osteoporosis within six months of the event. Swedish Medical Group (SMG) leadership requested that the clinical pharmacy team develop a protocol for improving this measure. Currently within SMG there are 5 clinical pharmacy practitioners (CPPs) in five independent clinics, servicing the additional 26 network clinics through electronic consultative services. This service would be provided to all clinics within SMG.

CPPs reviewed current procedure and developed a new workflow. Centralized population management team members identified patients with fractures through internal diagnosis codes and insurance claims and provided reports to CPPs. CPPs reviewed charts for appropriateness of DEXA versus osteoporosis pharmacotherapy and recommendations were made to primary care providers in patient's electronic medical record (EMR).

**JUSTIFICATION/DOCUMENTATION:** Prior to CPP involvement, SMG had a 3-star rating for osteoporosis management. Subsequent to the involvement of CPP in quarter four of 2015, SMG reached a 4-star rating with 62% of patients meeting the measure by 2016. During 2017, SMG remained at a 4-star rating with 52% of patients meeting the measure.

**ADAPTABILITY:** This service could be adapted to other institutions with access to population health level data from the electronic medical record (EMR). CPPs provided this population health service to all SMG clinics regardless of CPP home-clinic location. Recommendations were well-received by providers with documentation and justification for recommendations obtainable through the EMR.

**SIGNIFICANCE:** Clinical pharmacy involvement with five-star ratings within an institution increases reimbursement potential with healthcare plans as well as improves quality of care for patients to reduce the risk of future fractures.

**475. Implementation of a comprehensive medication management service in the primary care clinic of an urban health-system hospital** *Nicole Amadon, Pharm.D., BCGP*; Department of Pharmacy, Lincoln Medical and Mental Health Center, Bronx, NY

**SERVICE OR PROGRAM:** A comprehensive medication management (CMM) service was developed and integrated into the accountable care organization (ACO) outpatient service of a health-system hospital in New York City. One clinical pharmacist was added to one physician team in the primary care clinic. The population of focus for the initial rollout included seniors aged 65 years and older with a hemoglobin A1c greater than 9%. Initial CMM visits include medication reconciliation; evaluation of medication safety and efficacy; adherence assessment; medication and disease state education; and recommendations to the prescriber for medication optimization. Follow-up CMM visits focus on medication optimization, side effect mitigation, adherence counseling, and progressive education.

**JUSTIFICATION/DOCUMENTATION:** The CMM service provides collaborative support between pharmacy and the busy primary care clinic, which never had a pharmacist assisting with direct patient care. The service targets seniors, who are most at risk for polypharmacy and the complications therein, and focuses on those with uncontrolled

diabetes to help our ACO achieve the top medication adherence HEDIS core measures. Initial pharmacist success is measured by of the number of medication-related problems (MRP) identified and the pharmacist intervention acceptance rate. During the first month of active clinic, the pharmacist identified 56 MRP (average 4.7 per patient) and had a recommendation acceptance rate of 88%. Longitudinal clinical outcomes will include changes in A1c, blood pressure, LDL, and HEDIS measures.

**ADAPTABILITY:** This CMM model can be applied to any primary care practice. The model can also be adapted to focus on other outcomes or patient populations, given the broad scope of potential pharmacist interventions.

**SIGNIFICANCE:** ACO models are expanding under growing government policies and there is an opportunity for clinical pharmacists to integrate into primary care. Clinical pharmacists are uniquely positioned to perform CMM services that can improve patient adherence and impact quality measures in this pay-for-performance care model.

**476. Implementing a fracture liaison service in a large academic medical center** *Sarah J. Billups, Pharm.D.*[1], Alexandra Marcus, LSW[2], Mary Anderson Wallace, MD[3], Micol S. Rothman, MD[4], Lisa M. Schilling, MD[3]; [1]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO [2]Office of Value-Based Performance, University of Colorado Anschutz Medical Campus, Aurora, CO [3]Department of Medicine, University of Colorado School of Medicine, Aurora, CO [4]Department of Endocrinology, University of Colorado School of Medicine, Aurora, CO

**SERVICE OR PROGRAM:** An interprofessional team developed and implemented a Fracture Liaison Service (FLS) at University of Colorado Health System between July and December 2017 to improve care for patients experiencing an osteoporosis-related fracture. The team includes physicians, population health outreach coordinators, a clinical pharmacist, and an analyst. The FLS team meets monthly to review processes and outcomes and adapt workflows as needed.

Workflow: An analyst generates a weekly list of patients aged 65-89 seen at one of ten primary care practices and discharged from the hospital or ED with a billing diagnosis for hip, spine, wrist, or other osteoporosis-related fracture. The population outreach team contacts each patient after discharge to provide education, order bone-mineral-density (BMD) and laboratory testing as indicated, and schedule a primary care appointment for osteoporosis evaluation and fall-prevention as needed. The clinical pharmacist assesses pharmacotherapy needs and provides telephone education to patients initiating therapy. If pharmacotherapy is indicated but not initiated, the pharmacist sends therapeutic recommendations to the provider.

**JUSTIFICATION/DOCUMENTATION:** Osteoporosis is undertreated, even in patients with a recent fracture.[1] During the year before FLS implementation, 132/193 (67%) eligible post-fracture patients completed a follow-up clinic visit within 30 days. Of those without a recent BMD, only 15/162 (9%) had one performed within six months, and only 8/133 (6%) patients naïve to anti-osteoporosis therapy initiated treatment. Post-intervention interim analyses performed January 1-April 30, 2018 showed no difference in completed follow-up visits (58/88, 66%), but BMD testing and medication initiation went up to 16/65 (25%, p=0.002) and 10/66 (15%, p=0.014), respectively.

**ADAPTABILITY:** This service is adaptable to any healthcare system able to identify patients discharged with a fragility fracture and communicate with primary care providers. It could be conducted centrally or at the clinic level.

**SIGNIFICANCE:** The FLS has the potential to significantly improve post-fracture outcomes and decrease healthcare costs.

**477. Utility of a student-run transition of care service – perceptions and evaluation of student pharmacists** *Andrea Bejjani, Bachelor of Science*[1], Sharon Connor, Pharm.D.[2]; [1]School of Pharmacy, University of Pittsburgh, Pittsburgh, PA [2]University of Pittsburgh School of Pharmacy, Pittsburgh, PA

**SERVICE OR PROGRAM:** Described is a student-run transition of care (TOC) program in an urban community health center (HC) utilizing an innovative transition of care tool (ITOC) in a systematic process to review all patients at hospital discharge. Pharmacy students use the ITOC form to target patients at risk for drug-related problems (DRPs). Patient cases are presented to the clinical pharmacist for further management with the interprofessional team. The HC is in an underserved area that provides comprehensive patient-centered primary care to predominantly low-income patients.

**JUSTIFICATION/DOCUMENTATION:** TOC is often managed from an inpatient setting, limiting communication with the outpatient care team. In this model, student pharmacists reviewed 51 patient profiles over 6 months. 148 DRPs and 380 discrepancies were identified, with student-identified DRPs compared to pharmacist-identified DRPs. Students accurately identified 75% of the DRPs (41% vs. 65% pharmacist-identified) requiring intervention. Mixed quantitative-qualitative assessments evaluated student confidence and perceptions of the service. Qualitative assessments revealed that although initially challenged, students found support from the pharmacist-in-charge and standardized policies and procedures. Program evaluation through surveys revealed that students scored confidence to perform the process as a 4.75 on a Likert scale, indicating a strong agreement with the statement.

**ADAPTABILITY:** Similar student-led programs have the potential for success with pharmacist supervision. Students described the service as initially challenging, but at 6 months they were comfortable identifying DRPs and presenting cases to the pharmacist. The students indicated that they would be comfortable doing the process again.

**SIGNIFICANCE:** Almost 90% of patients experience a medication regimen alteration at hospital discharge. Patients receiving care in resource-constrained settings may be at higher risk. This program led to the accurate identification of 75% of DRPs leading to pharmacist follow-up for correction. Program assessment revealed increased student confidence over time. The process of identifying DRPs may be more efficient through the aid of student pharmacists.

**478. Implementation of a direct oral anticoagulant service in a pharmacist-managed anticoagulation clinic** *Bianca Korkis, Pharm.D.*[1], Alison Lobkovich, Pharm.D.[2], Insaf Mohammad, Pharm.D., BCACP[1], Candice L. Garwood, Pharm.D., FCCP, BCPS[1]; [1]Department of Pharmacy Practice, Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University, Detroit, MI [2]Department of Pharmacy, Harper University Hospital, Detroit Medical Center, Detroit, MI

**SERVICE OR PROGRAM:** In November 2017, a pharmacist-managed direct oral anticoagulant (DOAC) service was integrated into a traditional warfarin-based anticoagulation clinic (ACC) affiliated with an urban academic medical center. In this model, the pharmacist contacts the patient following referral to address urgent needs and arrange the first visit. The pharmacist's role includes assessing appropriateness of DOAC therapy, deciding on choice of anticoagulant therapy, laboratory monitoring, promoting adherence, and resolving drug access issues. Ongoing patient follow-up is provided with tailored frequency and mode of visits.

**JUSTIFICATION/DOCUMENTATION:** Several challenges exist with DOACs that warrant regular assessment and follow-up. These include DOAC prescribing nuances, poor adherence, and high cost. To date, 31 patients have been referred to the service and outcomes data has been collected for 18 patients. A total of 36 various pharmacist interventions have been documented. Safety and efficacy outcomes (e.g. bleeding and thromboembolic events) and rates of medication adherence are being measured to determine success of the service. Humanistic outcomes such as provider and patient satisfaction will also be measured.

**ADAPTABILITY:** This pharmacist-managed DOAC service was successfully integrated into an existing warfarin-based ACC without need for additional staff, space, or funding. Two pharmacists are managing the service, and each patient visit is completed in an average of 29 minutes. With use of a protocol for laboratory monitoring and follow-up as well as a mechanism for patient referral, this service could be implemented in other hospital-based or private pharmacist-managed ACCs.

**SIGNIFICANCE:** Pharmacists are equipped with the skills to ensure appropriateness of DOAC therapy, promote adherence, and resolve access issues. Poor adherence to DOACs has been associated with increased risk of stroke and mortality. Pharmacist-managed DOAC care has been shown to improve adherence when compared to usual care. We anticipate that this service will demonstrate improved safety and efficacy outcomes, medication adherence, and provider and patient satisfaction.

**479. Pharmacist assistance with shared decision making for drug therapy selection in patients with depression** Danielle Larson, Pharm. D. and *James D. Hoehns, Pharm.D., BCPS, FCCP*; University of Iowa College of Pharmacy and Northeast Iowa Family Practice Center, Waterloo, IA

**SERVICE OR PROGRAM:** Depression is a common and costly disease. Current evidence suggests minimal differences in efficacy among antidepressants. Patient preferences, in conjunction with distinct toxicities, burdens, and costs may be used to differentiate antidepressants. The primary objective of this prospective quality improvement study was to evaluate the impact of a shared decision-making (SDM) tool on initial medication selection among patients with depression. Eligible participants were adult patients (≥18 years) seen in clinic between November 2017-May 2018 with a diagnosis of depression and plan to initiate pharmacotherapy for depression. Patients with current/recent antidepressant use, suicidal ideation, pregnancy/breastfeeding, residents of long-term care facilities, and/or patients with major barriers to participate in SDM were excluded. Pharmacists met with patients during clinic appointments to discuss antidepressant medications using a SDM tool developed by Mayo Clinic. After discussion, patients identified a preferred antidepressant which was reviewed by the pharmacist for appropriateness. Pharmacists communicated this information to the physician who disclosed their initial planned antidepressant and made final determination of antidepressant prescribed.

**JUSTIFICATION/DOCUMENTATION:** To date, 10 patients have participated in the project. All patients completed face-to-face SDM discussion with a pharmacist. Physicians prescribed patients' preferred medication in 87.5% (7/8) of instances when there was initial discordance between patient/physician preferences. Interim results show that patient-preferred antidepressant and physician planned antidepressant matched only 20.0% (2/10) of the time. Overall, patients reported increased satisfaction with medical care after participation in the SDM process.

**ADAPTABILITY:** This pharmacist-driven project is applicable to ambulatory clinics caring for patients with depression. SDM tools, including the Depression Medication Choice© tool, are available free online.

**SIGNIFICANCE:** Pharmacist use of a SDM tool improved patient satisfaction and strongly influenced initial antidepressant selection. To the best of our knowledge this is the first evaluation of SDM affecting initial drug selection for depression.

**480. Great plains pharmacy-driven HCV echo – building capacity and filling clinical gaps to cure hepatitis c** *Paulina Deming, Pharm.D.*[1], Bradley Moran, Pharm.D.[2], Neelam Gazarian, Pharm.D.[3], Jonathan Owen, Pharm.D.[3], David Stephens, BSN, RN[4], Jessica Leston, MPH[4]; [1]College of Pharmacy, Department of Pharmacy Practice & Administrative Sciences, University of New Mexico Health Sciences Center, Albuquerque, NM [2]Fort Peck Service Unit, Indian Health Service (IHS), Poplar, MT [3]U.S. Public Health Service, Quentin N. Burdick Memorial Hospital, Belcourt, ND [4]Northwest Portland Area Indian Health Board, Portland, OR

**SERVICE OR PROGRAM:** Project ECHO (Extension for Community Healthcare Outcomes) was developed at the University of New Mexico Health Sciences Center (UNMHSC) to improve access to Hepatitis C virus (HCV) treatment and best practice HCV care. ECHO leverages videoconferencing technology to enable community primary care clinicians (PCCs) to present patient cases to a team of specialists during regular virtual clinics.

Unlike other teleECHO clinics, the Great Plains HCV ECHO is geared towards pharmacists and the faculty specialists providing clinical recommendations are pharmacists with expertise in HCV care.

**JUSTIFICATION/DOCUMENTATION:** American Indian and Alaska Native (AI/AN) people have the highest mortality rate from HCV of any race or ethnicity. Treatment rates among the AI/AN population are very low despite availability of highly effective HCV treatments. The Indian Health Service/Tribal/Urban Indian (I/T/U) primary care clinics are developing capacity to provide HCV cure and mitigating challenges such as lack of specialists and providing specialty care in rural areas.

Great Plains HCV ECHO launched in January 2018 with 13 clinical sites and 49 unique clinic participants joining the monthly teleECHO session. To date, 31 patients have been presented for recommendations on management/treatment.

**ADAPTABILITY:** ECHO case-based model trains PCCs to provide specialty care for complex conditions, such as HCV. Eventually, participation in Project ECHO creates a cascade of treatment beyond the number of cases presented in teleECHO clinics, allowing PCCs to gain the experience, knowledge, and confidence to treat complex conditions on their own.

**SIGNIFICANCE:** Many I/T/U clinics are in remote areas where patients experience barriers to healthcare. Pharmacists have emerged as an important component of clinical leadership. Pharmacists identified a clinical care gap, provide clinical expertise, and actively participate to address health care disparities in HCV care for AI/AN patients. The ECHO model provides a process to guide transformational change for HCV treatment for patients and systems change for I/T/U clinics.

**481. Identifying best practices in documenting comprehensive medication management** *Caitlin K. Frail, Pharm.D., MS, BCACP*[1], Carrie Blanchard, Pharm.D., MPH[2], Kylee Funk, Pharm.D., BCPS[1], Mary Roth McClurg, Pharm.D., MHS[3], Todd D. Sorensen, Pharm.D.[1]; [1]Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN [2]Center for Medication Optimization, UNC Eshelman School of Pharmacy, Chapel Hill, NC [3]UNC Eshelman School of Pharmacy, Chapel Hill, NC

**SERVICE OR PROGRAM:** A standardized approach to documentation is critical to communicating the pharmacists' patient care process (PPCP) to other healthcare providers and payers. Through the Comprehensive Medication Management (CMM) Effectiveness and Implementation Study, we developed a rubric to evaluate fidelity to the CMM PPCP through documentation review. Due to high variability in documentation across health systems, we were unable to validate the rubric. A team of three researchers reviewed 51 notes representing 13 health systems, and identified strengths and weaknesses in their documentation approach. Six best practices were identified: 1) consistent categorization of medication therapy problems (MTPs), 2) use of indication, effectiveness, safety, adherence (IESA) framework in assessment, 3) structured approach to medication reconciliation, 4) clear documentation of medication experience, 5) uniform organization of note, and 6) inclusion of explicit plans for plan implementation and follow up.

**JUSTIFICATION/DOCUMENTATION:** Recent efforts have been made to standardize the PPCP in practice and education. Documentation has not been discussed in detail as part of this standardization work, but it is a critical component of the ACCP Standards of Practice for Clinical Pharmacists.

**ADAPTABILITY:** The best practices identified can lead to a standardized template for documentation in practice, or be used for quality assurance, CMM service evaluation, or pharmacy student and resident education.

**SIGNIFICANCE:** Lack of consistency in pharmacists' documentation can lead to inefficient and ineffective communication with other healthcare providers. A standardized approach to documenting the PPCP can create efficiency in communicating with other care team members, increase providers' understanding and confidence in the service, enhance ability to extract data for quality measurement, and provides assurance to payers that payment is being provided for the expected level of service. The best practices identified from this work will be a valuable resource to help teach and communicate consistency to the CMM PPCP.

**482. Pharmacist-led transitions of care in an indigent population** *Jeanna Sewell, Pharm.D., BCACP*; Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Auburn, AL

**SERVICE OR PROGRAM:** A pharmacist-led transitions service was implemented in June 2017 between a community hospital and indigent clinic. Care coordinators call the pharmacist prior to uninsured patient discharge to schedule follow-up visit within 7-14 days. At their initial visit, the pharmacist assesses disease control, medication access and problems, and follow-up needs. One-month post-discharge, patients are seen by a provider where the patient establishes care, receives refills, and has a physical assessment. The pharmacist follows up with the patient via phone at 60-days post-discharge to determine disease state control and readmission status.

**JUSTIFICATION/DOCUMENTATION:** In 2017, 1 in 10 nonelderly Alabama residents lacked health insurance. Uninsured patients frequently land in the hospital and typically return to the hospital when future problems arise due to limited access to follow-up care. Cost associated with hospital care of indigent patients can be significant, therefore resources for supplying these patients with outpatient care are necessary. The purpose of this study is to determine the effectiveness of a pharmacist-led transitions of care program in an indigent population with limited access to primary care.

**ADAPTABILITY:** This service could be implemented in ambulatory care clinics in any area that serves patients with limited access to medical care, particularly those that are uninsured.

**SIGNIFICANCE:** In 6 months, 126 patients were referred for pharmacist follow-up and establishment of primary care. Of these patients, 70 (55.5%) attended their initial visit with the pharmacist. Of those that attended their initial visit, 11 (15.7%) and 16 (22.8%)

patients had a subsequent admission or ED visit within 30 days and 60 days of discharge, respectively. For those that did not attend, 11 (19.6%) and 14 (25%) patients had a subsequent admission or ED visit in 30 and 60 days, respectively. Through these visits, patients at high risk for hospital readmission were able to establish care with a provider.

**483. An implementation system for pharmacy practice: operationalizing effective comprehensive medication management delivery in primary care** *Melanie Livet, Ph.D.*[1], Carrie Blanchard, Pharm.D., MPH[2], Todd D. Sorensen, Pharm.D.[3], Mary Roth McClurg, Pharm.D., MHS[1]; [1]UNC Eshelman School of Pharmacy, Chapel Hill, NC [2]Center for Medication Optimization, UNC Eshelman School of Pharmacy, Chapel Hill, NC [3]Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN

**SERVICE OR PROGRAM**: The implementation system described in this project is a customizable blueprint for delivery of Comprehensive Medication Management (CMM) and other medication optimization services. This system is the result of merging implementation science expertise with lessons learned from the parent study, the "CMM in Primary Care" grant. This system is comprised of a number of elements, including implementation steps, activities, practical resources such as assessments and informational materials, and learning supports. While these components are integral to any implementation effort, this project describes their unique operationalization to delivery of CMM in a primary care context. Application of this system is described through an example.

**JUSTIFICATION/DOCUMENTATION**: Evaluations of medication optimization interventions have not produced consistent results. This lack of consistency can be attributed in part to implementation variability. Reducing variability requires use of approaches focused on optimizing implementation. Integrating implementation science within pharmacy practice has only recently emerged as a potential solution. However, to be effective, implementation strategies need to be customized to medication optimization interventions and healthcare settings. This project describes an effort to operationalize the implementation process for CMM in primary care settings.

**ADAPTABILITY:** This system can be used by pharmacists or other health professionals seeking to implement or improve implementation of CMM. While its operationalization is specific to CMM, the system itself is generalizable to any medication optimization interventions with additional tailoring.

**SIGNIFICANCE:** This implementation system is the first step-by-step blueprint to facilitate implementation of CMM prospectively grounded in implementation science theory and retrospectively refined based on lessons learned from application in a large study. Ensuring that medication optimization interventions, like CMM, are implemented as intended and effective requires creation of implementation systems that serve as a roadmap for those interested in delivering these interventions.

## CARDIOVASCULAR

**484. Impact of a novel medication education method for nurses on a cv surgery stepdown unit** *Lauren Czosnowski, Pharm.D.*[1], Jessica Heinowski, Pharm.D.[2]; [1]Pharmacy Practice, Butler University, Indianapolis, IN [2]Butler University, Indianapolis, IN

**SERVICE OR PROGRAM:** The pharmacist on the CV surgery step down unit has a bulletin board in the staff bathrooms to provide education to nurses regarding medications. The pharmacist sits on a quality and safety committee with unit leadership to identify medication related issues or medications for which staff could benefit from further education. Monthly, pharmacy students on rotation create education to be placed on the board for a month.

**JUSTIFICATION/DOCUMENTATION:** Nurses on the unit were requesting more education on medications for their own knowledge and to better educate patients. Concurrently, there was an initiative across the hospital to encourage nurses to educate their patients as they are administering medications. During a six-month period after the education board had been established, trivia questions regarding current topics were posted and nurses were invited to participate to assess efficacy of education delivery. Most nurses who participated answered questions correctly (89%). After this period, nurses were surveyed regarding the education board. Most nurses (69%) referenced the board at least once a month, and most (86.7%) felt more comfortable with medication information.

**ADAPTABILITY:** This project is easily adaptable, requiring only dedicated space and good communication to elicit feedback from team members regarding educational needs. Education topics could be easily adapted to fit any target population. Trainees can easily be involved with some guidance from a practitioner.

**SIGNIFICANCE:** Better educating nurses on medication issues has the potential to improve patient care by ensuring confidence when administering meds, helping nurses to better educate patients, and encouraging dialogue with the unit pharmacist. When nurses move to a new practice setting, they may not be familiar with the common medications utilized in that setting. By utilizing trainees to create education materials, they also improve their skills creating education materials and identifying pertinent information to include in these materials.

## CLINICAL ADMINISTRATION

**485. Development of a system pharmacy and therapeutics committee to lead quality outcomes** *Harminder Sikand, Pharm.D., F.C.S.H.P., . F.A.S.H.P., F.C.C.P.*[1], Melissa Flaherty, Pharm.D.[2]; [1]Department of Pharmacy, Scripps Mercy Hospital, San Diego, CA [2]Scripps Health, SAN DIEGO, CA

SERVICE OR PROGRAM: Scripps health is a 5 hospital acute care system with community and teaching hospitals. In 2015 each hospital had its own Pharmacy and Therapeutics (P and T) committee with site based formulary management process. This report will describe the deliberate journey to standardize the organization to a system P and T and formulary management process. JUSTIFICATION/

DOCUMENTATION: Site based P and T committees were not uniformly effective in formulary management both in volume of reviews, implementation of restrictions leading to inconsistent decision making. Standardization of P and T was focused on leveraging purchasing power, fiscal stewardship and creating a culture of shared decision making and accountability. Membership on the P and T council (PTC) included site P and T chairs, physician members, clinical pharmacy leaders, nursing representative, financial analyst, corporate pharmacy leader and executive sponsor. Standard work was created to establish a charter, governance, formulary review cycle, approval and appeal process. Communication cascade was developed to engage all stake holders and site P and T committees. The system Chief Medical Director socialized the concept at site based medical executive committees for endorsement. PTC was thus established as the sole formulary decision making body for the system. Adaptability: This systematic process was applied within health system over 30 months and was budget neutral. The concept and tools used are translatable across community, academic and inner-city institutions. Standard work tools and process flow maps were created. Significance: Prior to PTC, annually approximately 10 formulary reviews were conducted in the system. Since implementation, 30 reviews were performed. Formulary utilization was conducted to evaluate adherence to restrictions. In 2017, a savings of $3.5 million dollars was achieved with this initiative. Today, the PTC is recognized as a powerful decision making platform.

**486. USP <800> assessment of risk conducted by a community health system** *Cindy Brasher, Pharm.D., MS, BCPS*; Inpatient Pharmacy, Mission Hospital, Asheville, NC

**SERVICE OR PROGRAM:** In preparation of USP <800> enforcement, a multidisciplinary group at Mission Health System evaluated the list of hazardous medications administered throughout our organization to complete an assessment of risk to determine where practices will align or deviate from the strict recommendations of the NIOSH 2016 guidelines.

**JUSTIFICATION/DOCUMENTATION:** Medications administered at the 5 acute care hospitals of Mission Health System were evaluated based on the following criteria: inclusion on respective NIOSH tables, dosage form, volume, origination of dose (automated dispensing cabinet vs. pharmacy). Medications were further clinically reviewed based upon their indications for inclusion on the NIOSH tables.

**ADAPTABILITY:** Mission Health System identified areas for NIOSH Table 2 (biohazard) and Table 3 (reproductive risk) medications that practice will provide an increased level of protection from current state and long term exposure, but would still deviate from the strict recommendations of NIOSH. The use of closed system transfer devices was limited to NIOSH Table 1 medications (Antineoplastic Medications) for compounding and administration. Personal protective equipment and engineering controls were stratified based on impact of exposure. Alternative medication dosage forms were identified for use to limit exposure and handling.

**SIGNIFICANCE:** As compliance with USP <800> is required as of December 1, 2019, health care systems and pharmacies are choosing between strict adherence to NIOSH recommendations for handling hazardous medications and conducting assessments of risk to identify alternative practices that provide exposure protection for employees. This review of our process of conducting an assessment of risk outlines the elements that were evaluated and the conclusions that were identified to guide practice when handling hazardous medications.

**487. Mission experiential and research intern training (merit) program: development of a pharmacy student internship program at a community teaching hospital** *Cindy Brasher, Pharm.D., MS, BCPS*; Inpatient Pharmacy, Mission Hospital, Asheville, NC

**SERVICE OR PROGRAM:** The Mission Experiential and Research Intern Training (MERIT) program was developed at Mission Hospital in response to a need to further provide opportunities for pharmacy students to experience operational and quality improvement processes in the hospital setting in preparation for pharmacy residencies.

**JUSTIFICATION/DOCUMENTATION:** The MERIT Intern program incorporates 4 key areas throughout the pharmacy school experience: staffing in pharmacy technician roles, shadowing areas of interest, clinical research or process improvement project involvement, and clinical knowledge development. Pharmacy students have the opportunity to be trained in both general areas and specialized areas (medication history collection in Emergency Department, pediatrics, chemotherapy compounding, etc). Students will also participate in a research/quality improvement project that will be encouraged by the department to be presented at a state pharmacy meeting. Quarterly meetings include in clinical pearls and disease state discussions in additional to program business.

**ADAPTABILITY:** This program allows pharmacy students to learn more about the operational aspects of the inpatient pharmacy through staffing experiences and more about clinical aspects through research project development. The pharmacy department benefits from this internship experience by having a highly trained workforce for as needed positions and completing research to improve patient care quality.

**SIGNIFICANCE:** Pharmacy departments can benefit from an extended pharmacy internship program that includes staffing, clinical development, and research activities for pharmacy students. This type of program is mutually beneficial for pharmacy students because it prepares them for pharmacy residency through understanding the roles and workflow of pharmacy technicians, conducting research to improve processes and outcomes, and have an in-depth understanding of inpatient pharmacy distribution challenges.

## COMMUNITY PHARMACY PRACTICE

**488. Early implementation of the Pennsylvania pharmacists care network initial payor contract** *Kim C. Coley, Pharm.D.*[1], Joni Carroll,

Pharm.D.[1], Melinda Kozminski, Pharm.D.[1], Brandon Antinopoulos, Pharm.D.[1], Nicholas Leon, Pharm.D., BCPS, BCACP[2], David Pope, Pharm.D.[3], Pat Epple, CAE[4], Lucas Berenbrok, Pharm.D.[5], Melissa McGivney, Pharm.D.[1]; [1]University of Pittsburgh School of Pharmacy, Pittsburgh, PA [2]Jefferson College of Pharmacy, Penn Center for Primary Care, Penn Presbyterian Medical Center, Philadelphia, PA [3]Creative Pharmacist, Evans, GA [4]Pennsylvania Pharmacists Association, Harrisburg, PA [5]School of Pharmacy, University of Pittsburgh, Pittsburgh, PA

**SERVICE OR PROGRAM**: Implementation of an initial payor contract for provision of comprehensive medication management (CMM) within the Pennsylvania Pharmacists Care Network (PPCN) pharmacies began in September, 2017. There are 171 community pharmacies participating in PPCN. Of these, 128 pharmacies were eligible to participate based on geographic location in the payor's network. By the third month, 66 (52%) of eligible pharmacies signed the agreement to provide CMM services. Three major implementation stages (exploration, installation, and initial implementation) have occurred so far. Major tasks within these phases of implementation included: 1) network leadership team and structure formation; 2) stakeholder engagement and feedback; 3) pharmacist engagement and training; 4) solidifying key partnerships; and 5) patient care implementation and continuous quality improvement.

**JUSTIFICATION/DOCUMENTATION**: PPCN has established a viable network with a Medicaid payor contract enabling care to patients of all ages with one or more chronic medications at PPCN pharmacy locations. As of December 31, 2017, the contracted pharmacies completed 927 initial patient encounters and 122 follow-up encounters. Documentation of services is standardized across a single platform allowing for billing of services and patient outcome analyses.

**ADAPTABILITY:** A series of semi-structured, bi-weekly key informant interviews have been conducted with each pharmacy to learn from the successes and challenges of implementing this payor contract. To date, over 50 pharmacies have shared initial experiences. Initial results demonstrate immediate impact on individual patients of all ages, and the ability to reach patients who have been lost of care – including high risk patients, patients on Suboxone, and pediatric patients.

**SIGNIFICANCE:** Implementation of a payor contract to provide CMM to Medicaid patients through a state-wide practice network has launched in Pennsylvania. This initial implementation has demonstrated immediate impact on individual patients served. Sharing these learnings may guide implementation of reimbursable patient care services by other networks in the future.

## EDUCATION/TRAINING

**489. Implementation of an academic detailing program in a large, integrated health system** *Whitney Mortensen, Pharm.D., MBA, BCPS*, Sabrina Cole, Pharm.D., BCPS, CPHIMS and Jeffery L Olson, Pharm. D., MBA, BCPS, BCACP; Pharmacy Services, Intermountain Healthcare, Taylorsville, UT

**SERVICE OR PROGRAM:** The feasibility and usefulness of educational methods were evaluated within a large, integrated health system. The aim was to effectively implement and maintain a pharmacist-led academic detailing program (MedEd) to educate prescribers about medications. MedEd began with a focus on outpatient clinics and included: (1) a brief, bimonthly, in-person group discussion led by ambulatory care and community pharmacists; and (2) a short, monthly, electronic newsletter. MedEd was then redesigned to its current form – a durable, on-demand, web-based program – and includes: (1) brief device demonstration videos presented by ambulatory care and community pharmacists; (2) webinars led by ambulatory care and community pharmacists; and (3) access to biweekly editions of The Medical Letter. Excluding The Medical Letter, all MedEd content is developed internally by drug information specialists.

**JUSTIFICATION/DOCUMENTATION:** Many prescribers rely on pharmaceutical sales representatives for medication information, but a robust, pharmacist-led, academic detailing program can also meet that educational need. Additionally, academic detailing promotes safe, cost-effective, and evidence-based use of medications with the primary goal of providing high-quality patient care.

**ADAPTABILITY:** Either the initial design or the current design of MedEd could be replicated in other health systems based on available resources and program scope. While the initial design is a reasonable and effective approach, it is a resource-intensive option that is neither feasible nor sustainable for many health systems. The current design of MedEd allows for wide-spread access (including prescribers in rural areas) without the need for significant additional resources, making it a practical approach for other organizations.

**SIGNIFICANCE:** Effectively educating prescribers in health systems of differing size and complexity poses a variety of logistical challenges. A pharmacist-led academic detailing program can fill an educational gap for prescribers, promote pharmacist-prescriber relationships, increase the visibility of the pharmacy department, and improve patient care throughout the health system.

**490. Civilian pharmacy involvement in department of defense innovative readiness training** Abigail Hamlin, Pharm.D.. Candidate[1], Misha Thomason-Watts, Pharm.D.[2], *Anne Misher, Pharm.D., BCACP, BC-ADM, CDE*[3]; [1]School of Pharmacy, University of Georgia, Savannah, GA [2]University of Georgia, Savannah, GA [3]St. Joseph's/Candler Health System, Savannah, GA

**SERVICE OR PROGRAM:** The Department of Defense chose Savannah, Georgia for Innovative Readiness Training (IRT). Troops from every branch, along with healthcare volunteers, provided medical, dental, pharmaceutical, vision, and veterinary services at four locations. Civilian pharmacists from the University of Georgia (UGA) organized pharmacy services to supplement those provided by the military. Two UGA faculty attended meetings and coordinated volunteers. Clinical pharmacists, residents, fourth year pharmacy and pre-pharmacy students volunteered at discharge/dispensing areas at two of the four sites. Volunteers assisted with disease state and

medication education. Additionally, a clinical pharmacist provided in-service education for members of the military.

**JUSTIFICATION/DOCUMENTATION:** IRT is intended to help U.S. military with readiness training and provides healthcare at no cost to local communities. Civilian pharmacy services provided at IRT helped provide additional care for patients. The collaboration between military personnel and civilian pharmacists built civil/military relations. Medication education was provided primarily for antibiotics, nonsteroidal anti-inflammatory drugs, acetaminophen, steroids, and antihistamines. Patients were counseled on diabetes, hypertension, smoking cessation, nutrition, stress management, and exercise. IRT provided healthcare to 7,942 patients. Between two locations covered by civilian pharmacy services, 566 patients were served, and approximately 2,300 minutes of volunteer time was spent counseling. A one-hour in-service education was provided to 20 military personnel.

**ADAPTABILITY:** IRT is a collaborative program conducted throughout the United States. The program utilizes both military and civilian resources. The service provided in Savannah, GA is an example of how civilians can be involved and make an impact where trainings are offered. Equivalent services could be provided by other local pharmacists where IRT is conducted.

**SIGNIFICANCE:** In addition to the healthcare services provided to patients, pharmacy volunteers provided an opportunity for interprofessional collaboration with military medical personnel. Civilian pharmacists made an impact on IRT operations by providing recommendations for improvement in training procedures.

**491. Concomitant expansion of geriatric pharmacotherapy services and residency training experience** Priya Shah, Pharm.D.[1], Rebecca Chow, Pharm.D.[1], *Luigi Brunetti, Pharm.D., MPH, BCPS, BCGP*[2], Joan Perrone, RPh[1], Nancy Doherty, RPh, MS[1]; [1]Department of Pharmacy, Robert Wood Johnson University Hospital Somerset, Somerville, NJ [2]Department of Pharmacy Practice and Administration, Rutgers, The State University of New Jersey, Piscataway, NJ

**SERVICE OR PROGRAM:** The setting of this program is a 38-bed inpatient geriatric care unit located in a 365-bed community teaching medical center. The goal of the new service was to expand the exposure of pharmacists through decentralization to the geriatric patient care unit while creating an additional residency training experience. Services provided include order verification, participation in patient care rounds, medication reconciliation, intravenous to oral adjustment, and clinician education.

**JUSTIFICATION/DOCUMENTATION:** Prior to implementation of decentralized services to the geriatric unit, pharmacist involvement in geriatric care was limited to traditional order processing. The development of this program allows pharmacists to participate in direct patient care to optimize pharmacotherapy. The program was initially trialed with a pharmacy resident and decentralized pharmacist.

Following this trial period, all centralized pharmacists were trained to work as a decentralized pharmacist. The second pharmacy resident completed the geriatric rotation five months later as the program became more established. Metrics to assess the impact of the service included the increase in adverse events reported, medication interventions beyond those captured from traditional order processing, clinician perception of increased pharmacist involvement, and resident feedback on the experience. There was a four-fold increase in the number of patient counseling sessions from the trial period to the second resident's experience.

**ADAPTABILITY:** Based on feedback from residents and clinicians, the service will continue to evolve. This rotation will become a required learning experience to expose future residents to the role of the decentralized pharmacist. Next steps include analyzing the effect on patient satisfaction survey scores and interprofessional perception of pharmacy services.

**SIGNIFICANCE:** This service allows pharmacists to engage in direct patient care on a geriatric unit, improves quality of pharmacotherapy, and provides a residency rotational experience. Combining resident experiences with expanding clinical services allows residents to improve their knowledge base while learning strategies to justify expanding pharmacy programs.

**492. Development of an inpatient internal medicine and critical care pharmacy faculty shared service model** *Meredith Howard, Pharm.D.*[1], Jessica Schillig, Pharm.D.[2], Marian Gaviola, Pharm.D.[1]; [1]Department of Pharmacotherapy, University of North Texas System College of Pharmacy, Fort Worth, TX [2]Department of Pharmacy, Medical City Fort Worth, Fort Worth, TX

**SERVICE OR PROGRAM:** Two faculty pharmacists, specializing in Internal Medicine and Critical Care, practice at a community teaching hospital. Historically, faculty maintained their practice simultaneously for four half-shifts weekly throughout the year. A shared service model (SSM) was implemented last year which allowed for faculty to alternate on-service months, covering multiple patient care units for full shifts, while faculty off-service pursue research and teaching activities.

**JUSTIFICATION/DOCUMENTATION:** Faculty participation in SSMs are gaining popularity, particularly in ambulatory care. However, they are less common among inpatient faculty, especially involving different specialties. Benefits of SSMs may include improved efficiency and continuity of patient care.

**ADAPTABILITY:** Implementation of an SSM between faculty of two different specialties is feasible, may enhance patient care, and optimize efficiency. This approach can be implemented in several ways; 1) on-service faculty may cover the same units with one specialty unit serving as a primary focus at that time, or 2) faculty pharmacists cover their respective specialty units each service month and swap patient care unit coverage as needed. The former model may be best for hospitals with assigned unit-based clinical pharmacists, while the latter may be preferred when decentralized clinical pharmacists rotate unit assignments. Key factors for success include excellent communication and flexibility among all engaged stakeholders.

**SIGNIFICANCE:** In this model, faculty safely care for more patients and spend more time precepting. A survey of pharmacy staff

revealed the SSM was highly preferred compared to the historical model, citing improvements in continuity of care, student learning, and healthcare provider satisfaction. This represents a unique approach, and despite their different specialties, faculty successfully built a shared service that benefits patients, students, practice site, and the college. Given the demands placed on clinical faculty, unique and innovative methods that improve efficiency while maintaining excellence in clinical service, teaching, and scholarship are essential for success.

**493. Development and implementation of a pgy-1 residency equivalency certification program** *Kamaria Brown, Pharm.D.*[1], Susan Bear, Pharm.D.[1], Caleb Little, Pharm.D.[1], Lydia Wang, Pharm.D.[1], Shay Phillips, Pharm.D.[1], Nick Wilkins, Pharm.D.[2], Paige Carson, Pharm.D.[1], Fern Paul-Aviles, Pharm.D.[1], Tyler Greenwood Greenwood, Pharm. D.[1], Katherine Rector, Pharm.D.[1]; [1]Atrium Health, Charlotte, NC [2]Atrium Health, concord, NC

**SERVICE OR PROGRAM:** The ACCP Commentary on Residency Equivalency published in 2009 was utilized as a basis for development of a PGY-1 Residency Equivalency Certification at Atrium Health. Individuals completing the certification must fulfill requirements in line with ASHP residency standards and must submit a portfolio as evidence of proficiency. Applicants are paired with a pharmacist mentor to oversee and guide their journey from beginning to completion. Participation is voluntary, with certification granted to those pharmacists who apply and demonstrate excellence in their respective practice and profession.

**JUSTIFICATION/DOCUMENTATION:** The value and need for residency training is often not realized during the early career years. Atrium Health pharmacists who have been in practice in a non-clinical setting or in a limited clinical role repeatedly request opportunities for growth and development. In addition to our established career ladder, the Residency Equivalency Certification provides an additional pathway for training equivalent to that of a PGY-1 residency as well as a pathway for existing clinical practitioners to show that they have completed requirements and possess a skillset equal to those of a PGY-1 Resident.

**ADAPTABILITY:** Atrium Health employs a wide array of pharmacists with varied backgrounds. This opportunity is open to pharmacists in good standing who have demonstrated the necessary skill and proficiency to perform direct patient care activities as well as the level of commitment necessary to be a successful candidate. Once completed, the certification and completed portfolio will be used to demonstrate proficiency within Atrium Health and potentially beyond.

**SIGNIFICANCE:** It is the goal of the Atrium Health Division of Pharmacy that all pharmacists in direct patient care roles are trained in accordance with PGY-1 residency standards. The certification will help to bridge the gap between those in clinical practice who are residency trained and those who are not.

## ENDOCRINOLOGY

**494. Implementation of an interprofessional diabetes assessment for homeless individuals** *Emily Knezevich, Pharm.D., BCPS, CDE*[1], Cynthia Hadenfeldt, EdD, RN[2], Connie Liang, Pharm.D. Candidate[3], Kasey Rubin, Pharm.D. Candidate[3], Constance Atkinson, Pharm.D. Candidate[3], Kateri Petto, Pharm.D. Candidate[3]; [1]Department of Pharmacy Practice, Creighton University School of Pharmacy & Health Professions, Omaha, NE [2]Creighton University School of Nursing, Omaha, NE [3]Creighton University School of Pharmacy & Health Professions, Omaha, NE

**SERVICE OR PROGRAM:** Project Homeless Connect of Omaha (PHCO), an event held at Creighton University, is a day where the homeless can come for services that advance their lives. This year Creighton schools of pharmacy, nursing and medicine offered diabetes assessments, which allowed interprofessional assessment of individuals' compliance with medical standards for managing diabetes. Faculty members developed a tool students utilized to assess management. Additionally, a hemoglobin A1c test, obtained through grant funding, was completed. Diabetes education was provided during each interview. Patients identified as having poor control or with a new diagnosis were referred to a physician that day and provided a future appointment at a community health center. **JUSTIFICATION/DOCUMENTATION:** Prior PHCO events provided only random glucose testing and little diabetes education. In contrast, all participants at this event were screened for risk of developing diabetes. Of those who were high risk, 30.7% demonstrated pre-diabetes (A1c 5.7 – 6.4%). 50% of those who had diabetes demonstrated poor control (A1c >7%). 5% of individuals were newly identified as diabetic (A1c ≥ 6.5%).

**ADAPTABILITY:** The incidence of diabetes in the homeless population is growing. Pairing this event with a University having a service based mission is recommended to identify volunteers who desire to provide care to the underserved. Additionally, collaboration with an organization that is a large stakeholder in the community offered many resources to these clients, outside of health services.

**SIGNIFICANCE:** The diabetes assessment service provided by a interprofessional team was largely successful in meeting the needs this population. Many patients were identified as being at risk for developing diabetes, having poor control of their previously diagnosed condition, or being likely to have a new diagnosis of diabetes. This service gave those individuals the opportunity to have a discussion with a health professional they may not have had access to otherwise.

**495. Pharmacist led continuous glucose monitoring shared medical appointments** *Diana Isaacs, Pharm.D.*; Cleveland Clinic Diabetes Center, Cleveland, OH

**SERVICE OR PROGRAM:** Professional Continuous Glucose Monitoring (CGM(, which is owned by the clinic and loaned to patients, is covered by Medicare and most private insurance plans for people with diabetes. Pharmacists paired with diabetes educators to start CGM Shared Medical Appointments (SMA). During the first appointment,

the sensors are inserted. One week later, patients attend a follow-up SMA to have the CGM downloaded. The pharmacist makes medication adjustments as needed through the collaborative practice agreement. The diabetes educators recommend lifestyle changes. At the conclusion, the sensors are removed and each patient receives a copy of their CGM report along with individualized recommendations, which are shared with their provider. These visits usually include 5 patients, 1 pharmacist and 1 diabetes educator.

**JUSTIFICATION/DOCUMENTATION:** The reimbursement for CGM ranges from $156-$305 per insertion and $36-$92 per interpretation for each patient. The cost of each sensor is approximately $60. Therefore, a class of 5 patients yields a profit of $660-$1,685.

**ADAPTABILITY:** CGM technology continues to improve and become more affordable. Pharmacists have the skills to analyze CGM data to make medication changes. Professional CGM is also a billable procedure that pharmacists can utilize within various community and ambulatory care settings to generate revenue and improve health outcomes.

**SIGNIFICANCE:** Pharmacists do not yet have provider status. However, CGM offers an innovative way for pharmacists to work at the top of their license, improve patient outcomes and generate revenue since the procedure is reimbursable by insurance.

## FAMILY MEDICINE

**496. A pharmacist-managed latent tuberculosis service in a family medicine residency program** *Ann Philbrick, Pharm.D., BCPS, BCACP*[1], Ila M. Harris, Pharm.D., BCPS, FCCP[2], James Van Vooren, MD[2]; [1]Department of Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN [2]Department of Family Medicine and Community Health, University of Minnesota Medical School, Minneapolis, MN

**SERVICE OR PROGRAM:** Clinical pharmacists (CP) at a family medicine residency program developed a protocol to manage patients with latent tuberculosis (LTBI). Patients are diagnosed by a clinic physician and referred to the CP through an electronic medical record-based form. This form is reviewed by a care coordinator (CC) and medication is obtained free of charge from the local health department. Once the medication arrives, the CC schedules the patient for an initial visit with the CP. During this visit, the CP educates the patient on the disease and medication, potential adverse effects, and importance of adherence. The CP sees the patient monthly to assess for activation of the disease, adverse effects, adherence (by pill count), and need for laboratory monitoring. The patient receives a one-month supply of medication at each visit.

**JUSTIFICATION/DOCUMENTATION:** The overall prevalence of LTBI in the United States is 4.7 to 5%, but increases to 15.9 to 20.5% for foreign-born persons. Approximately 5 to 10% of persons with LTBI will convert into active disease, which can be difficult to treat. Additionally, completion rates are low with only about half of people completing treatment. Therefore, it is important that LTBI treatment be monitored closely by a healthcare professional.

**ADAPTABILITY:** This program can be adapted into any ambulatory care setting. It has been beneficial to add a non-pharmacist team member to the process in order to alleviate the administrative burden.

**SIGNIFICANCE:** In the first six months of the program, 18 patients have been referred to this program. All except one patient are immigrants from southeast Asia or Somalia. While many patients are straightforward and require little pharmacist intervention, a few unique scenarios have required more intensive monitoring, including exposure to multi-drug resistant tuberculosis, isoniazid-induced hepatotoxicity and isoniazid-tyramine drug interaction. Completion rates with therapy will be collected.

## GERIATRICS

**497. Improving medication safety among elderly patients in an ambulatory setting** Alyssa Berry, BS[1], Rebecca Burgett, BS[1], Erin Day, BS[1], Aron Hrubetz, BS[1], *James D. Hoehns, Pharm.D., BCPS, FCCP*[2]; [1]Department of Pharmacy Practice and Science, University of Iowa College of Pharmacy, Iowa City, IA [2]University of Iowa College of Pharmacy and Northeast Iowa Family Practice Center, Waterloo, IA

**SERVICE OR PROGRAM:** Inappropriate medication use in the elderly results in significant patient morbidity. The primary objective of this prospective quality improvement study was to evaluate if student pharmacist recommendations could decrease the use of potentially inappropriate medication (PIM) use in elderly patients. Second year student pharmacists reviewed medication profiles from patients at Northeast Iowa Family Practice Center. Eligible patients were ≥66 years of age and were identified by a PPRNet Clinical Quality Report (November 2016) that indicated a current prescription for a PIM based upon the American Geriatric Society Beers Criteria. Students reviewed medical records and contacted prescribing physicians (within electronic health record (EHR)) and patients (up to 3 attempts via telephone) to improve medication use.

**JUSTIFICATION/DOCUMENTATION:** There were 125 patients initially identified as receiving a PIM. Twenty-nine patients were excluded from analysis (deceased, hospice care, not taking PIM) resulting in 96 eligible patients (mean age, 74.5 years). Anticholinergics (20.8%), antihistamines (16.7%) and sedative-hypnotics (16.7%) were the most common PIM. Patients were taking PIMs for a long duration (mean, 39.6 months) and were most often prescribed on a regularly scheduled basis (55.2%). Results from student pharmacist interventions included: 29.2% of patients were no longer taking the PIM, 19.8% were unable to be reached via telephone, 12.5% and 11.5% of recommendations were refused by the patient and physician, respectively. Six (6.3%) PIMs were discontinued.

**ADAPTABILITY:** This student driven project is applicable to ambulatory clinics caring for elderly patients. Students were located offsite and communicated with physicians and patients remotely.

**SIGNIFICANCE:** Previous efforts (patient or provider focused) to improve medication use in the elderly have produced mixed results. Primary obstacles included contacting patients and physician or patient refusal of recommendations. This project utilized students earlier in their training. Minimizing the use of PIM in the elderly will likely require multifaceted approaches.

## HEMATOLOGY/ANTICOAGULATION

**498. Impact of integrating a standardized protocol for deep vein thrombosis prophylaxis into an order set in patients undergoing total joint arthroplasty** Kathryn Mundi, Pharm.D., Danielle Tompkins, Pharm.D., Julie Jun, Pharm.D., BCPS, Margaret Choye, Pharm.D., BCPS and *Nina Huynh*, *Pharm.D.*, *BCPS*; Department of Pharmacy Practice, University of Illinois College of Pharmacy, Chicago, IL

**SERVICE OR PROGRAM:** Venous thromboembolism (VTE) is a common postoperative complication following major orthopedic surgery. In an effort to improve the rate of post-operative VTE among the total joint arthroplasty (TJA) patients at the University of Illinois Hospital & Health Sciences System (UI Health), a standardized protocol for deep vein thrombosis (DVT) prophylaxis was developed using a multidisciplinary team including clinical pharmacists. The protocol was subsequently integrated into an order set and implemented in March 2016. The order set provided physicians decisional support for appropriate DVT prophylaxis including early ambulation, chemoprophylaxis and mechanical prophylaxis.

**JUSTIFICATION/DOCUMENTATION:** To evaluate the impact of an order set, clinical outcome measures including demographics, ambulation, chemoprophylaxis, mechanical prophylaxis, post-operative VTE and bleeding events were evaluated (May 2016-July 2017) and compared to data collected prior to the order set implementation (May 2014-July 2015). The implementation of the order set was associated with a timely initiation of chemoprophylaxis. Early ambulation was encouraged in both groups. Significant improvement was observed for mechanical prophylaxis (89% vs. 97%, p = 0.003). Post-operative VTE rates have decreased since the implementation of the order set (11% vs. 10%, p = 0.52). A shift of chemoprophylaxis pattern was noted. Aspirin has replaced warfarin as the most commonly used chemoprophylaxis. Bleeding rates were statistically lower since the implementation of the order set (11% vs. 4%, p = 0.001).

**ADAPTABILITY:** The order set was designed to provide physicians decisional support for appropriate DVT prophylaxis in patients undergoing TJA. The use of the order set can be adapted for other patient population and/or at other institutions.

**SIGNIFICANCE:** The use of the order set encouraged a multidisciplinary team approach to improve patient care. Clinical pharmacists can play a vital role in providing decisional support to a multidisciplinary team.

**499. Monitoring of the newer anticoagulants: justification and significance of a evidenced-based anticoagulation toolkit** *John Gums*, *Pharm.D.*[1], Beth A. Vanderheyden, Pharm.D.[2], David P. Reed, MD[3]; [1]Department of Pharmacotherapy and Translational Research, College of Pharmacy, University of Florida, Gainesville, FL [2]Pfizer Global Medical, Tallahassee, FL [3]Pfizer Global Medical, Dunedin, FL

**SERVICE OR PROGRAM:** Although DOACs do not require laboratory monitoring or frequent dose adjustments, patient-specific considerations including renal function, weight, age, concomitant medications and adherence require specialized knowledge when selecting the appropriate drug/dose to minimize the risk of bleeding complications. To optimize patient management, an unbranded anticoagulation toolkit was created. The toolkit is a resource management repository comprised of comprehensive, evidence-based components based on peer-reviewed literature. The toolkit includes patient-specific and state-of-the-art health information technology resources for the clinician such as digital referral streams, protocols, and clinical algorithms. The toolkit is dynamic and evolves over time with innovative approaches for enhancing patient engagement, improving DOAC adherence and increasing evidence-based monitoring of the DOACs.

**JUSTIFICATION/DOCUMENTATION:** The rate of atrial fibrillation (AF) in the US is increasing and is projected to > 10 million by 2050. In the PINNACLE registry, DOAC use increased from 0% to 25.8% and warfarin use decreased from 52.4% to 34.8% in the first 4 years after the DOACs approvals. Traditionally, AF patients in the US receiving warfarin therapy are followed longitudinally by > 3000 anticoagulation management services (AMS) utilizing published guidelines and institutional approved protocols. In comparison, there is no comprehensive, evidence-based resource available to assist AMS in the safe and effective management of DOAC patients.

**ADAPTABILITY:** Wide variability in the structure, function, and services provided by the AMS mandates that components be applicable to all practice levels and environments. The toolkit is designed as a turn-key, "menu-driven", and customizable resource so individual components are useful to the clinician, their practice setting, and patients.

**SIGNIFICANCE:** The anticoagulation toolkit is the first evidence-based, comprehensive, updatable resource that provides AMS clinicians with the tools to lead in the safe and effective management of DOAC patients. As DOAC use increases across expanding indications, the toolkit provides a significant advancement in the care of DOAC patients.

## INFECTIOUS DISEASES

**500E. The impact of education and prospective audit and feedback on reducing ciprofloxacin utilization at a small community academic hospital** *Alyssa Thompson*, *Pharm.D.*[1], Jason Newland, MD[2], Helen Newland, Pharm.D.[3], Jennifer Feldmann, MSN, ACNP-BC[2], Stephen Liang, MD, MPHS[2]; [1]Barnes-Jewish West County Hospital, Creve Coeur, MO [2]Washington University School of Medicine, St. Louis, MO [3]BJC Center for Clinical Excellence, St. Louis, MO

Presented at IDWeek, San Francisco, CA, October 3-7, 2018.

**501. Pharmacist directed empiric vancomycin de-escalation in pneumonia with MRSA nasal swab** *Kirstin Kooda, Pharm.D., BCPS, BCCCP*[1], Bradley Peters, Pharm.D., BCPS, BCCCP[2], Patrick Wieruszewski, Pharm.D.[3], Gabrielle Anderson, Pharm.D.[3], Gabriel Golfus, Pharm.D.[3], Lynn Estes, Pharm.D.[3]; [1]Department of Pharmacy Services, Mayo Clinic Hospital – Rochester, Rochester, MN [2]Department of Pharmacy, Mayo Clinic, Rochester, MN [3]Mayo Clinic, Rochester, MN

**SERVICE OR PROGRAM:** It is established that negative MRSA nasal colonization comports a 95-99% negative predictive value for the presence of MRSA pneumonia. In October 2017, we implemented a protocol allowing pharmacists to order an MRSA nasal swab in any patient in whom vancomycin was started for pneumonia. If the swab resulted negative, an automated reminder message flagged the pharmacist to lead discussion with the medical team favoring vancomycin de-escalation. The purpose of this program was to decrease the duration of empiric vancomycin use with MRSA swab guided de-escalation. This protocol was enacted in every inpatient setting, including the emergency department, intensive care units, and general hospital wards.

**JUSTIFICATION/DOCUMENTATION:** Standard empiric practice in our institution for healthcare-associated, hospital-acquired, and ventilator-associated pneumonia (HCAP, HAP, and VAP, respectively) includes vancomycin, despite a low rate of methicillin-resistant *Staphylococcus aureus* (MRSA) pneumonia. We assessed 49 patients pre-intervention (November 2016-February 2017) and 50 patients post-intervention (November 2017-February 2018). The median duration of vancomycin for pneumonia in the control period was 46.7 hours. After protocol implementation, the duration of vancomycin for pneumonia was reduced by 32.5% to a median of 31.5 hours.

**ADAPTABILITY:** We demonstrated feasibility of a pharmacist-driven vancomycin de-escalation protocol utilizing MRSA swabs, and believe extension to institutions with such microbiologic capabilities may be done with relative ease. We are pursuing incorporation of automatic MRSA swab ordering in the electronic pneumonia care order set at our institution.

**SIGNIFICANCE:** The importance of pharmacists as antimicrobial stewards in all of these areas is well established, and pharmacists on multidisciplinary teams possess a unique vantage point to utilize evidence-based medicine to minimize excessive use of antimicrobials. We demonstrated the ease and efficacy of this pharmacist driven protocol for rapid vancomycin de-escalation in HCAP, HAP, and VAP in all areas of inpatient care.

**502. Development and implementation of vancomycin dosing protocol in the inpatient setting** *Peirung Huang, Pharm.D. Candidate*, Kevin Purcell, MD, Pharm.D., M.H.A., Khiet Nguyen, Pharm.D., BCPS and Lauren Hernandez, Pharm.D., BCCCP; Department of Pharmacy, St. Luke's Baptist Hospital, San Antonio, TX

**SERVICE OR PROGRAM:** A vancomycin consult service is provided at our hospital. In order to standardize determination of an initial maintenance regimen by all pharmacists involved, a vancomycin dosing protocol based on a nomogram was developed. Patients with age <18 years, ABW <50 kg, CrCl <30 mL/min, and receiving renal replacement therapy (RRT) were excluded.

**JUSTIFICATION/DOCUMENTATION:** The vancomycin dosing protocol was developed to improve the percentage of time initial steady-state trough levels were within target range without increasing rates of acute kidney injury (AKI). The protocol defined vancomycin trough goals based on indication and targeted either 10-15 mcg/mL or 15-20 mcg/mL. AKI was defined as an increase in serum creatinine of 0.3 mg/dL or more within 48 hours. A pre- and post- protocol implementation evaluation was completed to measure success. Patients with inappropriately drawn trough levels and/or missed doses were excluded. Twenty-three patients were included in the pre- and post-protocol groups. The number of initial therapeutic trough levels was 5 (21%) in the pre-protocol group compared to 8 (35%) in the post-protocol group. More patients in the pre-protocol group had subtherapeutic troughs (56%) compared to the post-protocol group (44%). Evidence of AKI was seen in 8.7% and 4.4% of patients in the pre- and post-protocol groups, respectively.

**ADAPTABILITY:** This vancomycin dosing protocol can be used at other hospitals that provide a vancomycin consult service in which many pharmacists participate. Our next step is to continue use at our facility and collect data on a larger patient population to support the effectiveness and safety with an ultimate goal to expand system wide.

**SIGNIFICANCE:** The protocol employed a vancomycin dosing nomogram to provide guidance and standardization for pharmacists performing vancomycin consults in adult patients without exclusion criteria. Mild improvement in the initial target trough attainment without increasing the rate of AKI was accomplished.

**503. Implementation of pharmacist-driven penicillin allergy skin testing in a community hospital resulting in a change in scope of practice for pharmacists** *Nathon Parker, Pharm.D., BCPS AQ-ID*[1], Hoo Feng Choo, MD[1], Mandana Ghodrat, Pharm.D.[2]; [1]Cheyenne Regional Medical Center, Cheyenne, WY [2]214 E 23rd street, Cheyenne, WY

**SERVICE OR PROGRAM:** A pharmacist-driven penicillin (PCN) allergy skin testing program for inpatients was implemented in a 222 bed community hospital. This service was novel at Cheyenne Regional Medical Center (CRMC) for two main reasons: 1) pharmacist administration/interpretation of these tests instead of physicians or nurses; 2) scope of practice does not allow administration of intradermal injections by a pharmacist, but the Wyoming State Board of Pharmacy (WYBOP) has granted conditional approval to CRMC in order to collect data to present to the WYBOP in the fall of 2018, possibly resulting in a permanent change in the pharmacists' scope of practice.

**JUSTIFICATION/DOCUMENTATION::** The primary outcomes measured included: % of patients negative for PCN allergy, % of patients with antimicrobial regimen changes, number of days that length of stay (LOS) decreased, and associated cost savings. So far, 80% (28/35) of the patients have tested negative and 50% (14/28) have had their antimicrobial regimen changed. These changes have also resulted in

2.54 days of decreased LOS and a cost savings of around $7,800/patient.

**ADAPTABILITY:** This pharmacist-driven model can be implemented in various hospital settings and could easily be modified to also serve various outpatient settings. An ID-trained pharmacist can train others to help with this process.

**SIGNIFICANCE::** According to the CDC, up to 90% of PCN allergies are not true. Consequently, correcting these allergies in patients' medical records can lead to significant benefits for patients and the community including: decreases in unnecessary antibiotics, healthcare cost savings, improved patient outcomes, and decreased resistance of bacteria. It will also be very beneficial to the profession of pharmacy to extend the scope of practice to include administration of intradermal injections so that pharmacists may assist in additional roles in patient care.

## MEDICATION SAFETY

**504. Post-hospital discharge automated calling program to identify and resolve medication-related issues during care transition** Rafael Felippi, Pharm.D., BCPS[1], Janice Finder, RN, MSN[2], Theresa Pinn, RN[2], *Ashlyn Proske, Project analyst*[2]; [1]Department of Pharmacy Services, Houston Methodist Hospital; Houston Methodist Physicians' Alliance for Quality, Houston, TX [2]Houston Methodist Physicians' Alliance for Quality, Houston Methodist Hospital, Houston, TX

**SERVICE OR PROGRAM:** Nearly 20% of patients discharged from the hospital to home setting experience an adverse event. As a safeguard, an automated calling program was implemented at Houston Methodist (HM) Hospital System to all discharged patients in an effort to reduce readmissions and improve patient satisfaction at a reasonable cost. The telephonic questionnaire assesses: patients' health since leaving the facility and identifies patients with questions regarding discharge or care instructions, medications, follow-up appointments, or those who were dissatisfied with the care they received. The calls trigger care navigation nurses, pharmacists, patient liaisons, and/or coordinators to provide timely and proactive interventions.

**JUSTIFICATION/DOCUMENTATION:** 53,640 patients were contacted between December 2016 and August 2017. 27,093 (51%) patients completed the telephonic questionnaire and 7,456 (28%) triggered alerts. The drivers of the alerts were related to instructions (10%), medications (8%), follow-up care (7%), services (7%), health status (3%), and contact request (3%). Patients reached through the program had a lower readmission rate (9.2% vs. 12.1%) and patient satisfaction HCAHPS scores improved 2 points.

**ADAPTABILITY:** Most of the medication-related alerts are addressed by clinical pharmacists who are authorized agents for the HM physicians. There are two PGY-1 residency-trained full-time pharmacists. Pharmacy interns and residents rotate monthly. They address medication-therapy discrepancies and facilitate insurance prior authorization requests by educating patients and collaborating with physicians, retail pharmacies, and insurance companies. All communication is done telephonically.

**SIGNIFICANCE:** By implementing this program to all patients, the hospital is able to reach patients who would otherwise be overlooked if they were selected based on risk criteria or diagnosis. Reduction in hospital readmissions and increase in patient satisfaction provide the hospital both financial and quality interest in this program. It also streamlines the workflow since the alerts specify what the patients' questions and concerns are prior to calling them.

**505. Developing an interprofessional team to manage patients on combined opioid and benzodiazepine therapy** *Michael Conley, Pharm.D., BCACP*[1], Thomas Fantes, MD[2], Hillary Green, FNP-BC, RN[2], Jessica Andrade, Pharm.D.[2], Phyllis Baer, MD[2]; [1]Northeastern University, Boston, MA [2]Harbor Health Services, Inc., Mattapan, MA

**SERVICE OR PROGRAM**: In January 2017, our interprofessional team consisting of a clinical pharmacist, addiction nurse, and site medical director began managing patients on chronic concomitant opioids and benzodiazepines (BDZs) at a Federally Qualified Health Center in Boston, MA. The focus of this project was to taper or replace opioid-BDZ combinations with safe and efficacious therapy. A designated weekly clinical schedule was developed so the team could review and discuss patients before visits. During the visits, the team discussed with patients the risks of taking these medications in combination and developed an appropriate patient specific treatment.

**JUSTIFICATION/DOCUMENTATION:** There is a critical need to address the overprescribing of opioids, especially in combination with BDZs. We identified 81 patients on this combination and in the past year have scheduled 28 to meet with the team. The interplay of the three disciplines in the exam room was fundamental. The pharmacist provided clinical decision making, addiction nurse provided non-pharmacologic modalities and psychosocial support options, and, when needed, the medical director mandated a move toward safer therapy. Success was measured in dose reduction or medication discontinuation while maintaining or improving symptom control.

**ADAPTABILITY:** This interprofessional team can be implemented at any health center that has clinical pharmacy and support of medical leadership. It is essential that patients are included in the shared decision making. Even with a mandated dose reduction, the patient should be involved in the decision of which medication to decrease, what non-controlled alternatives to employ, and the time frame in which changes are made.

**SIGNIFICANCE:** The clinical pharmacist's expertise and perspective in medication management allows for enhanced team based care. The clinical pharmacist ensures that all interventions lead toward evidence based first line treatments, thereby reducing the potentially life threatening complications associated with these medications. Literature review shows limited use of an interprofessional team to deprescribe opioid-BZD combinations.

**506. Improving transitions of care for patients at high-risk for medication errors** *Andrew J. Crannage, Pharm.D., BCPS*[1], Erin K. Hennessey, Pharm.D., BCPS[1], Laura Challen, Pharm.D., MBA, BCPS, BCACP[1],

Alison Stevens, Pharm.D., BCPS[2], Tricia Berry, Pharm.D., BCPS[2]; [1]St. Louis College of Pharmacy / Mercy Hospital St. Louis, St. Louis, MO [2]St. Louis College of Pharmacy, St. Louis, MO

**SERVICE OR PROGRAM:** Pharmacist-led post-discharge telephone counseling positively affects patient outcomes; however, this approach is often limited by unsuccessful telephone contact due to unverified telephone numbers and uncertain patient availability once discharged. Clinical pharmacists at Mercy Hospital St. Louis designed a discharge education service for high-risk patients, defined as receiving greater than 12 medications, to reduce errors made during transition of care to home. This is accomplished, in part, by increasing success of telephone contact. Inpatient pharmacists provided comprehensive medication education and scheduled an appointment time for a post-discharge telephone call with an outpatient clinical pharmacist.

**JUSTIFICATION/DOCUMENTATION:** Ninety-two percent of patients have been successfully contacted within two days after discharge. This is increased from 20% prior to service implementation. At follow-up telephone calls, patients take an average of 16 medications, with 15% of medications having some form of discrepancy requiring an intervention when compared to discharge summaries. When asked if they understood what medications they are prescribed and why, 90% of patients strongly agreed, 10% agreed, and none disagreed. Additionally, when asked if they found the program beneficial, 85% strongly agreed, 10% agreed, and 5% neither agreed nor disagreed.

**ADAPTABILITY:** The patient population is well matched to the general population as many patients meet the high-risk criterion at discharge. Mean time to complete inpatient education, telephone appointment scheduling, and post-discharge telephone call is 37 minutes. Pharmacists can assume these roles and apply them in numerous settings where patients are being discharged home.

**SIGNIFICANCE:** The American College of Clinical Pharmacy Standards of Practice for Clinical Pharmacists documents guiding principles for patient-centered care. One component, "Follow-Up Evaluation and Medication Monitoring", employs pharmacists' unique skills to positively impact patient outcomes during transitions across healthcare settings. This service demonstrates how this concept can be implemented in practice, positioning pharmacists and trainees to interact with a high-risk population to optimize care.

**507. Hospital system response to outbreak of brodifacoum contaminated synthetic cannabinoids** *Renee Petzel Gimbar, Pharm.D.*[1], Michael Koronkowski, Pharm.D.[2], Margaret Choye, Pharm.D., BCPS[3], Christina McKnight, Pharm.D.[4], Jason Devgun, MD[5], Arkady Rasin, MD[5], Timothy Meehan, MD, MPH[6], Trevonne Thompson, MD[6], Jennie Jarrett, Pharm.D., BCPS, MMedEd[7]; [1]Department of Pharmacy Practice, University of Illinois at Chicago College of Pharmacy, Chicago, IL [2]Pharmacy Practice, University of Illinois at Chicago, Chicago, IL [3]Department of Pharmacy Practice, University of Illinois College of Pharmacy, Chicago, IL [4]Pharmacy Practice, University of Illinois at Chicago College of Pharmacy, Chicago, IL [5]Toxikon Consortium, Chicago, IL [6]Emergency Medicine, University of Illinois at Chicago College of Medicine, Chicago, IL [7]College of Pharmacy; Department of Pharmacy Practice, University of Illinois at Chicago, Chicago, IL

**SERVICE OR PROGRAM:** A comprehensive, coordinated medication management program was devised to care for patients amid an outbreak presenting with contaminated synthetic cannabinoid coagulopathies. These patients required high-dose phytonidione with long-term management. Initially, patients are identified in the emergency department by the medical toxicology service through their coagulopathy and exposure to contaminated synthetic cannabinoids. The toxicology clinical pharmacist (TCP) then coordinates inpatient care with medical team clinical pharmacists, focusing on care transition medication management due to limitations including insurance coverage, medication cost and drug shortages. Medication Assistance Program pharmacists facilitate procurement of medication at discharge and ongoing dispensing at our outpatient institutional pharmacy. TCP provides telephonic outpatient medication management for long-term follow-up and titration.

**JUSTIFICATION/DOCUMENTATION:** During March/April 2018 an outbreak of contaminated synthetic cannabinoids was identified in Illinois. These synthetic cannabinoids were contaminated with rodenticide (brodifacoum) substances that are vitamin K antagonists resulting in long term coagulopathies. Currently, four documented deaths related to contaminated synthetic cannabinoid coagulopathy have occurred. This patient population has significant social barriers, such as alternative lifestyle choices, unstable housing and limited health insurance coverage, that make patient care and long-term follow-up challenging. This service was necessary to provide access to life-saving medications. Since being in the care of this targeted program, patients have maintained INRs below 2 and have no reported bleeding complications.

**ADAPTABILITY:** Clinical pharmacists are trained to manage medications related to INR lab values. This exposure to rodenticide contaminated substances is not unique and could occur in urban or rural areas. As a telephonic long-term management plan, this program is easily adaptable to many settings.

**SIGNIFICANCE:** Coordinated care transition efforts from clinical pharmacists ensured continued treatment for patients with rodenticide-induced coagulopathy. This coordinated effort highlights how clinical pharmacists can be leaders for care management for future toxicologic or other outbreaks requiring long-term medication and follow-up.

## ONCOLOGY

**508. A pharmacist-monitored oral chemotherapy program at a community hospital** *Lien Do, Pharm.D.*, Kevin Hiroo, Pharm.D. and Jane White, Pharm.D.; Department of Pharmacy, Valley Medical Center, Renton, WA

**SERVICE OR PROGRAM:** To initiate a pharmacist-monitored oral chemotherapy program and assess its impact on patient care and medication safety in an oncology clinic at a community hospital.

**JUSTIFICATION/DOCUMENTATION:** With an estimated 25% of chemotherapy in the pipeline being formulated as oral agents, oral

chemotherapy is becoming the forefront in cancer treatment. Many challenges come with oral chemotherapy, including shifting many of the responsibilities of managing the treatment regimen and monitoring toxicities from the oncology team to the patient. Oncology pharmacists can help bridge this gap, however.

A collaborative agreement was established between the oncology pharmacists and the oncologists whereby the oncology pharmacists: review all oral chemotherapy prescriptions prior to routing to the pharmacy, counsel all patients starting on oral chemotherapy, facilitate coordination of care with the pharmacy and patient to prevent delays in drug procurement, monitor the patient closely for side effects and adherence by following up with the patient one week after therapy initiation and monthly thereafter.

In the 10-month period after the program's inception, the oncology pharmacists reviewed 662 oral chemotherapy prescriptions, monitored 141 patients, and documented 26 clinically significant interventions. Survey results from patients showed that the oncology pharmacists' involvement helped patients gain a better understanding of their treatment, and patients knew how to handle their oral chemotherapy and manage side effects. Survey results from the oncologists and oncology clinic staff showed that the oncology pharmacists' involvement increased the clinic's workflow efficiency in regards to oral chemotherapy, and the clinic staff felt more confident patients were taking their oral chemotherapy as prescribed.

**ADAPTABILITY:** With the agreement of the oncologists, this program can be easily adapted by any oncology clinic.

**SIGNIFICANCE:** The implementation of the pharmacist-monitored oral chemotherapy program has improved medication safety, minimized delays in chemotherapy initiation, and reduced the time the providers spent on oral chemotherapy-related issues.

## PAIN MANAGEMENT/ANALGESIA

**509. Opioid de-escalation plans: educating to reduce opioid use following hospital surgical discharge** *Jeremiah Saunders, Pharm.D.*[1], Laura Myhre, Pharm.D., BCPS[1], Nancy Chen, Pharm.D.[1], Kimberly Karwoski, Pharm.D., BCPS[1], Eze Elechi, Pharm.D., BCPS[1], Julie L. Cunningham, Pharm.D.[2]; [1]Department of Pharmacy, Mayo Clinic Hospital, Rochester, MN [2]Department of Hospital Pharmacy Services; College of Medicine Mayo Clinic, Mayo Clinic, Rochester, MN

**SERVICE OR PROGRAM:** A national call to action related to opioid prescribing led to the development of new opioid prescriptions guidelines for post-surgical patients on hospital discharge at a large academic medical center. A multidisciplinary team partnered to implement the guideline recommendations with significantly reduced opioid quantities based on surgical procedure. However, a gap in patient knowledge and education regarding pain management for opioid naïve patients was identified. A four week pharmacist pilot was approved to initiate an opioid de-escalation education plan for orthopedic surgery patients at hospital discharge. The pharmacist's role included assessing the appropriateness of the opioid quantity prescribed at discharge, creating an individualized de-escalation worksheet based on the expected duration of opioid use, and interviewing patients to discuss goals of pain management including utilizing non-opioid mechanisms, and safe disposal.

**JUSTIFICATION/DOCUMENTATION:** Only 55% (n=17/31) of patients could list the opioid they had been taking in the last twenty-four hours, 52% (n=16/31) were aware of appropriate opioid disposal and 55% (n=17/31) knew the risks of taking opioids. Encouragingly, 87% (n=27/31) of patients were both actively engaged in the discussion and claimed to have improved understanding of opioids after education.

**ADAPTABILITY:** Individual pharmacist education for each patient dismissed on opioids is not a sustainable practice in a large medical institution with an extensive surgical practice. However, a standardized handout for nurse-provided education is a feasible alternative. After completion of the initial pharmacist-led pilot, the opioid worksheet was adapted to a standard handout for nursing to administer.

**SIGNIFICANCE:** Standardized opioid and pain medication reduction education was developed to meet a gap in patient knowledge as well as new Joint Commission practice standards based off direct pharmacist-patient interviews. Pharmacist involvement throughout the development of targeted inpatient opioid education is imperative given the high-risk nature of opioid medication and its potential for misuse.

## PERI-OPERATIVE CARE

**510. Curbing the enthusiasm: stewardship of high-risk, high-cost drugs in perioperative settings** *Sara Jordan, Pharm.D., BCPS*[1], Brian Kramer, Pharm.D.[1], Adam Trimble, Pharm.D.[2]; [1]Grant Medical Center (OhioHealth), Columbus, OH [2]Pharmacy Services, Grant Medical Center (OhioHealth), Columbus, OH

**SERVICE OR PROGRAM:** Grant Medical Center (GMC) is a community not-for-profit teaching hospital and Level 1 Trauma Center in Columbus, Ohio, and performs >20,000 surgeries annually. The perioperative clinical pharmacy team at GMC consists of 8 individuals who rotate through 3 operating room/orthopedic service positions staffed every weekday. In accordance with the ACCP Standards of Practice, the team has advanced clinical pharmacist roles in perioperative settings to optimize patient and institutional outcomes. Successful stewardship efforts have been an invaluable byproduct of this practice advancement.

**JUSTIFICATION/DOCUMENTATION:** Institutional P&T committees are increasingly challenged to consider costs of care in their decision-making, which is complicated by external factors including the opioid epidemic and nationwide drug shortages. Three medications in particular, sugammadex, intravenous acetaminophen, and liposomal bupivacaine, have been at the forefront of hospital P&T challenges as a result. Our team has successfully driven stewardship efforts for these agents as evidenced by reduced utilization informed by evidence-based medicine, dramatic cost savings compared to similar institutions, and lack of negative effects on related clinical quality metrics. We describe clinical pharmacist-led strategies that have yielded measurable results, including medication protocol development and

implementation, data analysis and presentation, targeted interprofessional collaborations, and prospective research.

**ADAPTABILITY:** We demonstrate the vital importance of developing dedicated clinical perioperative pharmacists at institutions performing surgery in order to improve patient care and drive cost-savings initiatives. We describe specific competencies and strategies we have developed to facilitate positioning of clinical pharmacists as leaders in this arena, including cost justification through stewardship of high-risk, high-cost medications.

**SIGNIFICANCE:** We have positioned clinical pharmacists to drive successful medication stewardship efforts by leveraging interdisciplinary relationships and clinical expertise in an increasingly vital practice area. Proven strategies that optimize both quality and cost of care will only become more critical as surgical specialties move to bundled payment systems.

## PHARMACOECONOMICS/OUTCOMES

**511. Implementation of a hemophilia management program improves clinical outcomes** *Giles Slocum, Pharm.D.*[1], Gary Peksa, Pharm.D.[2], Thomas Webb, MBA[3], Ishaq Lat, Pharm.D., FCCM, FCCP[1]; [1]Department of Pharmacy, Rush University Medical Center, Chicago, IL [2]Departments of Pharmacy and Emergency Medicine, Rush University Medical Center, Chicago, IL [3]Clinical Resource Management, Rush University Medical Center, Chicago, IL

**SERVICE OR PROGRAM:** The Hemophilia Management Program (HMP) was developed to improve care and reduce spending for the treatment of hemophilia patients. The HMP promoted interdisciplinary education, clinical management, and continuity of care through one lead pharmacist and additional pharmacists trained for supporting roles. Prior to the HMP, the Department of Pharmacy assisted with drug acquisition and dispensing. The HMP expanded clinical pharmacy services through inclusion as part of the comprehensive care team for hemophilia patients at our medical center.

**JUSTIFICATION/DOCUMENTATION:** Clotting factor concentrates (CFCs) are costly, and hemophilia patients often require multiple doses to maintain hemostasis. In 2016, the Department of Pharmacy's drug expense for CFCs was $4.6 million (15% of the drug budget). A business proposal for the HMP outlined a return on investment (ROI) of 3:1 cost savings, based on dedicated pharmacy services of stewardship, treatment guidance, and formulary management of CFC expenditures. Additional quantitative measures included length of stay (LOS) and rate of blood transfusions.

**ADAPTABILITY:** Our report attests to the clinical care of pharmacists trained by our HMP, and the potential for programs like ours to be transferable to centers treating hemophilia patients, thereby expanding the scope of pharmacy practice.

**SIGNIFICANCE:** In total, the HMP resulted in a net savings of $2.7 million for factor expense for 2017. The cost savings based on CFC expense resulted in a ROI of 20:1, far exceeding projections. The average LOS per patient stayed consistent with prior years, and the need for blood transfusions per patient was reduced. Design and implementation of the HMP resulted in significant cost savings, improved efficiency, and enhanced clinical service for patients with hemophilia. This expansion of pharmacy services has become the first pharmacy-led program in the country to not only reduce costs but also improve clinical outcomes.

## PHARMACOGENOMICS/ PHARMACOGENETICS

**512. Implementation of a pharmacist-led pharmacogenetics consult clinic in a primary care setting** *Meghan J. Arwood, Pharm.D.*[1], Eric A. Dietrich, Pharm.D.[2], Benjamin Q. Duong, Pharm.D.[1], D. Max Smith III, Pharm.D.[1], Eric I. Rosenberg, MD, MSPH, FACP[3], Katherine N. Huber, MD[4], Ying Nagoshi, MD, Ph.D.[4], Ashleigh Wright, MD[4], Jeffrey T. Budd, MD[4], Amanda R. Elsey, MHA[1], Larisa H. Cavallari, Pharm.D.[1], Kristin W. Weitzel, Pharm.D.[1], Julie A. Johnson, Pharm.D.[1], John Gums, Pharm.D.[2]; [1]Department of Pharmacotherapy and Translational Research, Center for Pharmacogenomics, College of Pharmacy, University of Florida, Gainesville, FL [2]Department of Pharmacotherapy and Translational Research, College of Pharmacy, University of Florida, Gainesville, FL [3]Division of General Internal Medicine, Department of Medicine, College of Medicine, University of Florida, Gainesville, FL [4]Division of General Internal Medicine, Department of Medicine, College of Medicine; UF Health Internal Medicine-Tower Hill, University of Florida, Gainesville, FL

**SERVICE OR PROGRAM:** The UF-Health Personalized Medicine Program (PMP) is a multidisciplinary, pharmacist-led practice providing evidence-based pharmacogenetics (PGx) recommendations to guide drug/dose selection. Since 2011, continued growth of the PMP and refinement of its infrastructure, along with collaboration of physicians, pharmacists, and informaticians, led to the development of an outpatient referral-based PGx consult clinic. In 2017, PMP launched this clinic at UF-Health Internal Medicine-Tower Hill (IMTH), where providers refer patients for in-person consultation with a PGx-trained pharmacist. The pharmacist's role is to confirm the need for and order PGx testing, deliver PGx-based drug/dose recommendations to providers, and educate patients and providers on PGx results.

**JUSTIFICATION/DOCUMENTATION:** IMTH was chosen for the PGx clinic since 58% patients were taking ≥1 target medication(s) informed by *CYP2C19/CYP2D6* testing (i.e.certain opioids, SSRIs, PPIs). Inappropriate dosing/section of these medications can lead to delays in therapeutic benefit and/or adverse effects, including death. Many patients had PGx results that make "normal" dosing unfavorable(Table-1), increasing their risk for such events. Providers not only correctly identified difficult-to-treat patients based on genotype, but accepted 12/13(92.3%) of recommendations.

**ADAPTABILITY:** Based upon current successes, PMP plans to expand the PGx clinic to other primary care clinics, with similar medication utilization rates, providers, and target population.

**SIGNIFICANCE:** Our higher proportion of extreme metabolizers argues that our provider education on who to refer has been successful and that by getting patients' genotypes earlier, we can reduce trial-and-error prescribing. Also, our high recommendation acceptance rate

reveals trust in PGx-pharmacists, highlighting that they are well-positioned to optimize patient care.

**Table-1.** PGx results: Clinic patients vs population

| CYP2C19 Phenotype* | Clinic Patients,%(n=21) | Population, % |
|---|---|---|
| **Ultrarapid metabolizers** | **14.3** | **2.5** |
| **Rapid metabolizers** | 23.8 | 21.8 |
| **Normal metabolizers** | 19.0 | 47.4 |
| **Intermediate metabolizers** | 28.6 | 25.9 |
| **Poor metabolizers** | **14.3** | **2.3** |
| **CYP2D6 Phenotype†** | **(n=19)** | |
| **Normal-Ultrarapid metabolizers** | 0 | 6.0 |
| **Normal metabolizers** | 57.9 | 81.3 |
| **Intermediate metabolizers** | **10.5** | **4.5** |
| **Poor metabolizers** | **26.3** | **3.7** |
| **Indeterminate** | 5.3 | 4.6 |

*$P$=0.0004;†$P$=0.0010

## PSYCHIATRY

**513. Clinical pharmacy intervention to improve laboratory monitoring of patients prescribed second-generation antipsychotics in a primary care clinic** Julianna Rivich, Pharm.D. and *Benjamin Chavez, Pharm.D.*; Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

**SERVICE OR PROGRAM:** This service by clinical pharmacists aimed to improve metabolic monitoring of patients prescribed second-generation antipsychotics (SGAs) in a Federally Qualified Health Center primary care clinic. Patients receiving a prescription for an SGA between 10/2016 and 9/2017 were reviewed. If a patient was due for routine fasting blood glucose or lipid tests at baseline, 3 months, or annually, a message was sent to the primary care provider (PCP) via the electronic medical record. Clinical pharmacist ordered applicable labs and informed the patient to have them drawn. When labs were completed, the pharmacist called patients with the results. Recommendations for repeat testing or addition of therapy were made by clinical pharmacist to the PCP.

**JUSTIFICATION/DOCUMENTATION:** This service met a previously identified need at this clinic. In 2017, it was found that annual monitoring of glucose and lipids was completed in 71% and 40% of Medicaid patients, respectively, in this clinic system. Our intervention in a sample of 41 patients in one clinic found that annual monitoring of glucose and lipids was completed in 44% and 49% of patients, respectively. This increased after pharmacist intervention to 71% and 66%, respectively.

**ADAPTABILITY:** This service would be valuable for pharmacists to replicate in other outpatient settings. Recommendations from the 2004 consensus statement from the American Diabetes Association and American Psychological Association served as an outline guiding recommended monitoring of patients prescribed SGAs.

**SIGNIFICANCE:** This service was successfully implemented by an ambulatory care pharmacy resident working in a medically underserved clinic. Its impact may be most significant in primary care clinics where routine metabolic monitoring of SGAs is suboptimal. Improving monitoring practices of patients prescribed SGAs can help to reduce the risk and prevent progression of metabolic complications.

**514. Implementation and evaluation of a pharmacist-led benzodiazepine taper service at San Francisco veterans affairs health care system** *Tessa Rife, Pharm.D., BCGP, CACP*[1], Jennifer Corapi, Pharm.D.[2]; [1]Department of Pharmacy; School of Pharmacy, San Francisco Veterans Affairs Health Care System; University of California, San Francisco, San Francisco, CA [2]Department of Pharmacy, San Francisco Veterans Affairs Health Care System, San Francisco, CA

**SERVICE OR PROGRAM:** We implemented a pharmacist-led benzodiazepine education and tapering service at San Francisco Veterans Affairs Health Care System. Veterans are referred for face-to-face, video, telephone, and/or electronic (e-consult) consultation. We evaluate history of benzodiazepine use/alternatives, withdrawal, overdose, suicidality, and current/past substance use, provide education on adverse event risks and safer alternatives, discuss concerns/treatment preferences, and partner with veterans and their medical providers to individualize taper care plans.

**JUSTIFICATION/DOCUMENTATION:** Benzodiazepines are commonly prescribed medications, yet increasing evidence demonstrates concerning risk for respiratory depression and overdose with opioids/other central nervous system depressants. Additional risk has been demonstrated in older adults and those with medical comorbidity, including cognitive impairment, traumatic brain injury, posttraumatic stress disorder, suicide history/risk, substance use disorder history/active use, fall history/risk, and chronic pain. New and innovative strategies are urgently needed to reduce benzodiazepine use in these high-risk populations.

**ADAPTABILITY:** Benzodiazepine education and tapering has been described in a variety of settings/strategies: patient and provider-focused education, letter/education mailing campaigns, interdisciplinary and pharmacist-led de-prescribing initiatives, and pharmacotherapy- and behavioral therapy-assisted tapering. Our service uses a combination of these strategies, focusing on reducing use in high-risk veterans.

**SIGNIFICANCE:** A total of 49 consults for benzodiazepine education/tapering were received for 46 unique outpatients February 2016 through April 2018. Veterans were primarily evaluated via e-consult (n=21, 42.8%) or a combination of visit types (n=19, 38.8%). Of 17 e-consult-only veterans with 3-month post-consult data available, mean diazepam equivalent daily dose (DEDD) reduced from 16.7mg±20.1mg to 7.5mg±8mg. Of 23 veterans receiving any other visit type or combination of visits with 3-month post-discharge data available, mean DEDD reduced from 17.1mg±17.3mg to 5.6mg±16.5mg. Of those 39 consultations, 21 (53.8%) were completely off therapy with benzodiazepines 3-months post-consult/discharge. Engagement in care with a pharmacist-led benzodiazepine

taper service was successful in reducing benzodiazepine use in high-risk veterans.

**515. Adult attention deficit and hyperactivity disorder (ADHD) clinic: a collaboration between psychiatry, primary care and pharmacy to improve access, care experience and affordability** *Corinne Johnson, Pharm.D., MBA*; Clinical Pharmacy Services, Kaiser Northwest, Portland, OR

**SERVICE OR PROGRAM:** In 2015, Kaiser Permanente Northwest (KPNW) implemented a collaborative, team-based adult ADHD service. Psychiatry developed criteria to triage uncomplicated patients to select appointment slots for evaluation. The screening workflow, clinical interview and documentation were standardized. Pharmacy developed an adult ADHD practice resource to provide care guidance and a CDTM protocol for a pharmacist to provide medication management until stable and then transition care to Primary Care. Primary Care leadership approved the service model, including that patients remain under Primary Care management and are not added to the psychiatrist's case load.

**JUSTIFICATION/DOCUMENTATION:** The Psychiatry department set a goal to improve patient access. A high number of referrals were for uncomplicated adult ADHD. Many Primary Care clinicians sought assistance with diagnosis and medication management. Pharmacy had noted an increasing number of adults treated for ADHD as well as an opportunity to improve care and treatment affordability. The service metrics include number of patients managed, weeks until stable, number of pharmacist touches and minutes spent, psychiatrist time saved, participant satisfaction, medication utilization and cost.

**ADAPTABILITY:** The collaboration between Psychiatry, Primary Care and Pharmacy could be replicated within an integrated care organization or adapted for other care delivery systems. The tools developed could be shared (e.g., practice resource, service criteria, protocol, documentation, prescribing criteria, etc.).

**SIGNIFICANCE:** The service has improved access to Psychiatry and the satisfaction of Psychiatry and Primary Care with the care delivery process and transition of care. Additionally, it has improved the care experience through shared decision making, and care standardization and coordination. The service helped lower treatment costs due to use of preferred medications and regimen optimization. Subsequent pharmacy initiatives arose from this service including dose consolidation, regimen optimization, prescribing criteria development for non-preferred medications the application of which achieved pharmacy cost savings of approximately $1.4 million in 2016.

## SUBSTANCE ABUSE/TOXICOLOGY

**516. Substance use intervention team pharmacist** *Tran Tran, Pharm.D., BCPS*[1], Kathryn Perticone, APN[2], Henry Swoboda, MD[3], Elisabeth Ramsey, LCSW[3], Emily McKernan, LCSW[4], Kristin Hill, MS[3]; [1]Chicago College of Pharmacy, Midwestern University, Downers Grove, IL [2]Psychiatry, Rush University Medical Center, Chicago, IL [3]Rush University Medical Center, Chicago, IL [4]Rush University Medical Center, Chciago, IL

**SERVICE OR PROGRAM:** The Substance Use Intervention Team (SUIT) is a team-based consultation service consisting of physicians, advanced practice nurses, social workers and a pharmacist working together to screen and treat patients at risk for opioids and other substances.

**JUSTIFICATION/DOCUMENTATION:** SUIT was created by a hospital initiative to address substance use disorder (SUD) as an anticipated target for future CMS guidelines. The program is built on inpatient SUD screening to identify patients who would benefit from brief intervention and medication assisted therapy (MAT). The program has successfully screened 80.4 % of all inpatient admissions. SUIT enabled updates to be made to institutional policies, procedures, and hospital formulary to effectively manage patients with revised assessment and medication protocols. SUIT oversaw the revisions to the Clinical Opioid Withdrawal Scale (COWS) protocol and medication order sets. The formulary was expanded to increase access to all forms of MAT and the hospital's outpatient pharmacy inventory was tailored to include medication formulations that were preferred by insurers or more affordable to patients. SUIT also runs an addiction clinic to monitor treatment maintenance. Collectively, these accomplishments will help expand the buprenorphine services offered by our institution by 200%.

**ADAPTABILITY:** MAT is the cornerstone for successful treatment of SUD. As medication experts, pharmacists are ideally positioned to interpret the unique economic, regulatory and pharmacokinetic issues specific to MAT. For our program, 0.5 FTE was funded by federal grants to establish a faculty pharmacist as a key member of SUIT.

**SIGNIFICANCE:** Pharmacists knowledgeable in harm reduction, motivational interviewing and MAT can contribute to the provision of high-quality care for patients with SUD. Their role improves the comprehensiveness of services offered by the institution and the pharmacy profession. The absence of post-graduate training and employment for pharmacists in addiction medicine supports the need for more literature describing pharmacists in this role.

## ADVANCES IN INTERNATIONAL CLINICAL PHARMACY PRACTICE, EDUCATION, OR TRAINING

## AMBULATORY CARE

**517. Implementation of the medicine change counseling by pharmacy (MCCP) service to improve drug adherence and therapeutic outcome of chronic disease patients with change of regimen in a specialist out-patient clinic (SOPC) in Hong Kong** *Alfred Ka Chun Lok, MPharm, M Clin Pharm*[1], Cheung Hei Choi, MBChB, MRCP, FHKCP, FHKAM (MEDICINE)[2], Wilson Yun Shing Leung, BPharm, Ph.D., BCPS[1], Lai Fun Lau, BPharm[1], Tsz Ming Ng, BPharm, M Clin Pharm, BCPS[1], Alan Worsley, BSc, MSc, Ph.D., Cert Ed (HE)[3]; [1]Department of Pharmacy, Queen Elizabeth Hospital, Hong Kong, Hong Kong

[2]Department of Medicine, Queen Elizabeth Hospital, Hong Kong, Hong Kong [3]Department of Pharmacology and Pharmacy, The University of Hong Kong, Hong Kong, Hong Kong

**SERVICE OR PROGRAM:** MCCP ("the service") was implemented at the SOPC Pharmacy of a general acute hospital in HK since June 2016. Patients with regimen changes are referred by doctors in clinic. Pharmacist provides initial counseling with emphasis on regimen changes; and makes follow-up phone calls to assess patients' adherence and provides advice until patients fully adhered to new regimen.

**JUSTIFICATION/DOCUMENTATION:** Due to the busy environment and limited manpower at SOPC Pharmacy (>1,500 prescriptions/day managed by 2-3 pharmacists and ~15 pharmacy technicians), it is not possible to provide detailed education/counselling to every patient. The service was piloted as a cost-effective approach to prioritize medication counseling to patients with recent regimen changes, as inadequate understanding of regimen changes may compromise patients' drug adherence and disease control. A 14-week, retrospective study was conducted to assess program outcome. Primary endpoint was patient's adherence to his/her new regimen after the service. Secondary endpoint was change in HbA1c in a subgroup of patients with recent change in Metformin dosage who received the service compared to historical control. Metformin was chosen as dosage change was commonest with Metformin amongst all chronic drugs; and clinical outcome could be assessed objectively using HbA1c. Tertiary endpoint was patient satisfaction.

**ADAPTABILITY:** 248 patients received the service within the study period; 96.1% of the regimen changes were taken as prescribed with an average compliance score of 95.7±19.6%. In the secondary analysis, MCCP was associated with a trend for HbA1c reduction compared to historical control (-0.57%±0.83% vs. -0.21%±0.74%, p=0.08). Overall, 71.0% of the patients rated "most satisfied" with the service. A similar service could be reproduced/extended to other out-patient settings with high patient volume and limited manpower in HK.

**SIGNIFICANCE:** This service which targets patients at high risk of non-adherence resulted in high levels of patient's adherence to new regimen and has potential to improve patients' clinical outcome.

**518. Pharmacist- led peer delivery program for services and chronic medications to patients living with non-communicable disease in rural, western Kenya** Immaculate Kerubo, BPharm[1], Sara Fletcher, Pharm.D., MPH[2], Edith Tonui, BPharm[1], James Kamadi, B.ComMs[1], Rakhi Karwa, Pharm.D.[2], Mercy Maina, BPharm, MPH[3], Imran Manji, BPharm, MPH[3], Monica Miller, Pharm.D., MSC[4], Benson Njuguna, BPharm[3], Ellen Schellhase, Pharm.D.[4], *Dan Tran*, *Pharm.D.*[2], Sonak Pastakia, Pharm.D., MPH, Ph.D.[2]; [1]Academic Model Providing Access to Healthcare (AMPATH), Eldoret, Kenya [2]Department of Pharmacy Practice, Purdue University College of Pharmacy / Purdue Kenya Partnership, Eldoret, Kenya [3]Moi Teaching and Referral Hospital, Eldoret, Kenya [4]Department of Pharmacy Practice, Purdue University College of Pharmacy, West Lafayette, IN

**SERVICE OR PROGRAM:** The pharmacist- led peer delivery program provides services including point-of-care blood pressure (BP) and blood glucose (BG) measurements and chronic medications to patients living with non-communicable diseases (NCD) such as diabetes or hypertension. The program operates in two communities in rural western Kenya – Milo and Turbo, with populations of 14,000 and 35,000 respectively. Using pharmacist-developed clinical protocols, -community health workers (CHWs) – trained by clinical pharmacists and clinical officers- deliver these services based on patient – or provider-initiated requests.

**JUSTIFICATION/DOCUMENTATION:** We have documented that unavailability of medicines, distance to clinics and long queues are barriers to access to NCD care in our population. Patients often travel great distances to get to clinics, thirty minutes to several hours on foot or motorbikes. Our program remedies these barriers by- (1) utilizing a high-quality pharmacist-led supply chain system (revolving fund pharmacy) to ensure availability of medicines and (2) training CHWs ("peers") using basic clinical protocols to appropriately triage and deliver management services (BP and BG measurements) and chronic medications to patients who need them. This delivery model was developed after a community needs assessment, in which, approximately 75% felt that a peer delivery program would address the above care gaps.

**ADAPTABILITY:** The adaptability of this program is largely due to its simplicity. Necessary components include patient interest, appropriately trained CHWs, a reliable supply chain and contextualized and culturally-appropriate clinical protocols. Additionally, CHWs are known and trusted community members who are qualified to provide basic medical tasks and medication delivery with appropriate training.

**SIGNIFICANCE:** This program demonstrates that pharmacists can be effective in implementing care programs that provide critical NCD services in the community and outside of health facility settings. The goal of the program is to enhance adherence to medications and to improve clinical outcomes in resource-constrained settings, using a community- centered approach.

## COMMUNITY PHARMACY PRACTICE

**519. Community pharmacist-led allergic rhinitis management (c-pharm) service in singapore** Joanne SH Yap, BSc(Pharm)(Hons)[1], Colin Tang, BSc(Pharm)(Hons)[2], Boon Ka Chong, MSc (Comm Pharm), CGP[2], *Kai Zhen Yap*, *Ph.D.*[1]; [1]Department of Pharmacy, National University of Singapore, Singapore, Singapore [2]Department of Pharmacy, Watson's Personal Care Stores Pte Ltd, Singapore, Singapore

**SERVICE OR PROGRAM:** C-PhARM was started by Watson's Personal Care Stores Pte Ltd (Singapore) in April 2016. Pharmacist interventions including face-to-face patient assessment, individualized care plan and phone follow-up to optimise allergic rhinitis (AR) self-management are based on Watson's in-house AR management protocol (with reference to ARIA guidelines and tailored for use in community pharmacy setting). Training for pharmacists involved online self-study readings, interactive workshop, and academic detailing of AR therapeutics and service protocol.

**JUSTIFICATION/DOCUMENTATION:** In Singapore, AR prevalence is high (13.1%), and recent reclassification of intranasal corticosteroids

(INC) had enhanced public's access to first-line treatment from community pharmacies without requiring a prescription. Yet, self-management was suboptimal, due to underuse of INC and non-adherence to prescribed treatment[1]. Hence, C-PhARM is imperative for optimising AR self-management in the community. C-PhARM's feasibility was demonstrated in a process evaluation study using the Medical Research Council's 6-elements framework[2], where 13 (23.2%) pharmacists enrolled 45 customers into C-PhARM over nine months and provided at least one follow-up for 32 customers, with 29 successfully exiting C-PhARM. All 20 customers who responded to a satisfaction survey deemed pharmacists to be professional and knowledgeable in providing clear and detailed information about AR. However, the lack of protected time was a pharmacist-reported barrier to service provision.

**ADAPTABILITY:** While better resource management may improve pharmacists' participation in C-PhARM service provision, further studies on C-PhARM's outcomes and cost-effectiveness are required.

**SIGNIFICANCE:** Nevertheless, C-PhARM demonstrated potential for implementation at other pharmacy chains to benefit more AR patients. Similar programs for improving self-management of other minor ailments treated at community pharmacy may also ensue.

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**520. Proton pump inhibitor de-prescribing initiative conducted at a community pharmacy** *Frank Hack, BSc Phm, MSc*[1], Ahalya Mehta, BSc, Pharm D[2], Yu Jin Lee, BSc, Pharm D Candidate[3]; [1]Faculty of Pharmacy, University of Toronto/Shoppers Drug Mart, Toronto, ON, Canada [2]Shoppers Drug Mart 827, Toronto, ON, Canada [3]4th yr Faculty of Pharmacy, Doctor of Pharmacy Candidate, University of Toronto, Toronto, ON, Canada

**SERVICE OR PROGRAM:** A Proton Pump Inhibitor (PPI) de-prescribing initiative was conducted at a community pharmacy in Toronto, Canada. This program was performed over a 5-week period between July 10, 2017 to August 18, 2017 during which 514 patients were dispensed PPIs and included in the program. Pharmacists contacted patients and determined their eligibility for de-prescribing using an evidence based clinical practice guideline. Eligible patients were informed of the rationale, including the potential harm of using PPIs without an ongoing indication for more than 4 to 8 weeks. Patients began a 1-week trial of alternate day therapy with their PPI regimen, and were contacted on Day 8 for follow-up to assess feasibility of stopping PPI therapy in collaboration with the prescribing physician.

**JUSTIFICATION/DOCUMENTATION:** In Canada PPIs ware ranked 7$^{th}$ in overall drug utilization cost in 2015. As per Health Canada, over 33 million prescriptions for PPIs were dispensed in 2016. The most common indication for PPIs is gastroesophageal reflux disease with symptoms resolving in approximately 80% of patients after 4-8 weeks. PPI usage is usually well tolerated however potential side effects include increased risk of fractures, pneumonia and *C. difficile* infections. Out of 514 patients who were prescribed PPIs, 62% (321/514) were candidates for de-prescribing, 28% (89/321) consented to participate, 80% (71/89) received approval from their physicians to attempt the 1-week trial and 77% (55/71) of patients successfully stopped PPI therapy.

**ADAPTABILITY:** Most PPI de-prescribing interventions are conducted in a hospital, long-term care home or primary care clinics. Community pharmacies are ideally positioned to carry out similar de-prescribing initiatives.

**SIGNIFICANCE:** This initiative demonstrated the feasibility of conducting pharmacist initiated de-prescribing programs in the community pharmacy setting. Similar programs in other pharmacies have the potential to improve overall health outcomes and significantly reduce costs to public and private healthcare systems.

**521. Mydispense: international collaboration to advance community pharmacy practice through simulation** *Clark Kebodeaux, Pharm.D., BCACP*[1], Vivanne Mak, BPharm(Hons), Ph.D., GCHE[2], Tina Brock, BSPharm, EdD[2], Lisa Holle, Pharm.D., BCOP[3], Jill Fitzgerald, Pharm. D.[3], Marcus Ferrone, Pharm.D.[4], Jennifer Marriott, BPharm, Ph.D., GCHE[2], Keith Sewell, MS[2], Keenan Beaumont, BIT[2], Marian Costelloe, MS[2]; [1]Department of Pharmacy Practice & Science, University of Kentucky College of Pharmacy, Lexington, KY [2]Faculty of Pharmacy & Pharmaceutical Sciences, Monash University, Melbourne, Australia [3]Department of Pharmacy Practice, University of Connecticut School of Pharmacy, Storrs, CT [4]Clinical Pharmacy, University of California, San Francisco, San Francisco, CA

**SERVICE OR PROGRAM:** MyDispense is a freely available international community pharmacy simulation designed and developed by Monash University to provide the opportunity to teach, practice, and assess the medication use process in a virtual pharmacy setting. MyDispense was developed in response to an educational need in Australia but through effective global collaboration, is now used by student pharmacists in multiple countries and has contributed to growth in the pharmacy simulation community.

**JUSTIFICATION/DOCUMENTATION:** MyDispense has expanded its focus from the technical process of dispensing to decision-making regarding prescription and self-care (OTC) medications, verification activities, and prioritization scenarios common in community practice. Instances of MyDispense can be tailored by country or region enabling pharmacy faculty to design units, tutorials, and exercises that span the continuum of the medication use process – from the product to the patient – and support students working in realistic and clinical virtual situations.

**ADAPTABILITY:** MyDispense is now used in over 61 schools and colleges of pharmacy across the globe. This includes 6 continents and 18 countries all of which can import and export their exercises domestically and internationally. Internationally, there have been 422 virtual

patients, 40 virtual prescribers, and nearly 3,000 medications included in the database. These efforts have resulted in student pharmacists completing over 470,000 exercises since the initial implementation.

**SIGNIFICANCE:** In response to interest in the global community, the second International MyDispense Symposium was held in Prato, Italy in July 2018. The 34 institutions and 19 countries represented there participated in the official release of the latest software version. MyDispense version 6.0 combines prescription, self-care, and verification exercises into scenarios requiring clinical and time management skills to improve care for patients in community pharmacy. The MyDispense community has also expanded to include representatives from pharmacy technician training programs.

## DRUG INFORMATION

**522. An innovative medication education from pharmacy to bedside enhances patient-centered care for complex medically ill patients in central taiwan** *Huey-Ling Chang, Pharm.D., MS,* and Ching-Ya Huang, Ph.D.; Department of Pharmacy, China Medical University Hospital, Taichung City, Taiwan

**SERVICE OR PROGRAM:** Multidisciplinary discharge services adopted medication counselling to provide knowledge and skills to patients or caregivers to ensure drug compliance. Case management nurses coordinated multidisciplinary discharge services based on counselling scoring model. Medication counselling was requested for patients scored equal and greater than 7 points. Meanwhile, pharmacy launched a unique computerized system that integrated drug information database for comprising a patient-specific medication education handout. Upon receiving counselling, pharmacists would assess therapeutic regimens, arranged a bedside counselling appointment to demonstrate drug efficacy and safety, and distributed medication education handout to patients or caregivers. Medication compliance was evaluated during the follow-up in 2 weeks.

**JUSTIFICATION/DOCUMENTATION:** A pivotal study was performed to exam 154 cases received medication counselling between March, 2017 and April, 2018. Top 5 highly demanding points of care were identified in Pulmonology, Neurosurgery, Neurology, Hematology and Oncology, and Cardiovascular Medicine. Despite 25% patients or caregivers were lost in follow-up for personal or health problems, the remaining 75% presented 95% medication compliance. Sub-analyses on the medication compliance revealed caregivers were primarily aged around 41-64 years (60%) and secondly aged above 65 years (23%). The caregivers were mainly the patient's children (65%) or spouse (22%). Most caregivers achieved senior high school (41%) and undergraduate (36%) degrees.

**ADAPTABILITY:** The medically ill patients or primary caregivers understand drug information pertains to current therapies and learn the skills to maneuver drug-related issues. Pharmacists play a vital role in patient-centered care to ensure drug compliance.

**SIGNIFICANCE:** This preliminary evaluation provides a scope of hospital discharge services to patients requiring extended health care. The outcomes of pharmacist-led medication counselling provided a guide to enhance point of care.

## EDUCATION/TRAINING

**523. Implementation of a diverse and customized clinical pharmacy training program for international pharmacists and students** *Marina Kawaguchi-Suzuki, Pharm.D., Ph.D.*[1], Kris Marcus, BSPharm[1], Jeff Fortner, Pharm.D.[1], Madeline Fry, Pharm.D.[1], Judy Flynn, PA-C[2], Nicola Carter, Ph.D.[1], Sigrid Roberts, Ph.D.[1]; [1]School of Pharmacy, Pacific University, Hillsboro, OR [2]School of Physician Assistant Studies, Pacific University, Hillsboro, OR

**SERVICE OR PROGRAM:** A clinical pharmacy training program was implemented by a United States (U.S.) academic institution and partner pharmacies, clinics, and healthcare systems to provide diverse exposure to U.S. pharmacy practice for international pharmacists, scholars, and students. This program identifies gaps in visiting professional's knowledge and customizes the training to address their needs during their visits. Participants are recruited through international organizations, as well as personal requests from abroad. The program is initiated in the participants home country where they conduct a detailed needs-assessment and gap-analysis, which is communicated to the Office of Global Pharmacy Education and Research. Participants come for on-site training in the U.S., and upon return to their country, they complete a reflection to help implement professional goals and provide feedback for further program improvement.

**JUSTIFICATION/DOCUMENTATION:** Prior to the program's initiation, clinical training for international visitors was limited to a primarily academic environment, and diversification of the training towards clinical pharmacy was desired based on needs-assessments from participants. The program was initiated in 2017, and training requests were received from Austria, India, Indonesia, Algeria, and Egypt as of January, 2018. The most recent training included clinical shadowing at community, institutional, and ambulatory care settings, including both primary and specialty care. Additionally, inter-professional shadowing was provided with a physician assistant.

**ADAPTABILITY:** The needs-assessment and gap-analysis have been helpful to screen potential participants for their commitment and to match their interests with the expertise the program can offer. Students were found to be interested in various aspects of clinical pharmacy, whereas practitioners have a more focused interest. Some identified challenges include pharmacist/faculty time, available expertise, and paperwork coordination.

**SIGNIFICANCE:** With the program implementation, participant demographics and training were considerably diversified. The program aims to promote clinical pharmacy tailored to the needs of participants and their countries.

**524. Development of exchange program for clinical pharmacy training between Japanese and U.S. pharmacy students** *Marina Kawaguchi-Suzuki, Pharm.D., Ph.D.*[1], Naomi Nagai, Ph.D.[2], Yukari Ogawa, Ph.

D.[2], Tetsuro Yumoto, Ph.D.[3], Junzo Kamei, Ph.D.[3], Ian C. Doyle, Pharm.D., BCPS[4], Reza Karimi, RPh, Ph.D.[5]; [1]School of Pharmacy, Pacific University, Hillsboro, OR [2]Department of Pharmaceutical Sciences, Musashino University, Tokyo, Japan [3]Hoshi University, Tokyo, Japan [4]Pacific University Oregon School of Pharmacy, Hillsboro, OR [5]School of Pharmacy, Pacific University Oregon, Hillsboro, OR

**SERVICE OR PROGRAM:** An exchange program for clinical pharmacy training (EPCPT) was developed by joint effort of an academic institution in the United States (U.S.) and two universities in Japan to promote clinical pharmacy training for both U.S. and Japanese students. Students from each institution participate in four-week structured EPCPT. Prior to visiting each other's country for on-site training, students complete preparatory learning modules provided by hosting preceptors. On-site learning activities include engagement in classroom activities with local students and shadowing at unique practice settings. Topic discussions are incorporated into EPCPT to yield in-depth concept understanding.

**JUSTIFICATION/DOCUMENTATION:** The program was developed to meet students' interests and needs and to increase cultural awareness in healthcare. Examples of learning items identified for U.S. students are: 1) advantages and disadvantages of government-based universal healthcare, 2) care for the growing elderly population, and 3) practice incorporating herbal/traditional medicine. Focus items for Japanese students are: 1) oral and written communication skills for patient care using medical English, 2) diverse clinical pharmacy practices in the U.S. and their implementation through collaborative care with medical teams, and 3) interprofessional education. Any unique medications used in a respective country are identified and summarized as part of EPCPT assignments.

**ADAPTABILITY:** Uniqueness of each country's practice and learning points need to be identified and discussed to develop a meaningful program for each other. Learning opportunities at clinical sites in the hosting country need to be coordinated in advance. Language difference can be a barrier but also an opportunity for Japanese students to learn medical English (identified as a necessary area for improvement).

**SIGNIFICANCE:** EPCPT aims to broaden student's perspective and improve clinical skills by providing hands-on educational opportunities in Japan and the U.S. Students learn uniqueness of each country's healthcare system, comparative advantages, and challenges through activities in classroom and clinical settings.

**525. A collaborative international Pharm.D. program: bridging clinical education and practice across the world** *Jennifer T Pham, Pharm.D., BCPS, BCPPS*[1], Lilian M. Azzopardi, BPharm. (Hons.). MPhil., Ph.D.., MRPharmS, FFIP[2], Alan Lau, Pharm.D.[1], Jennie Jarrett, Pharm.D., BCPS, MMedEd[1]; [1]College of Pharmacy; Department of Pharmacy Practice, University of Illinois at Chicago, Chicago, IL [2]Department of Pharmacy, University of Malta, Msida, Malta

**SERVICE OR PROGRAM:** The University of Malta (UM) and the University of Illinois at Chicago (UIC) developed a collaborative Pharm.D. program for international pharmacists in 2014. The 3-year program consists of didactics, clinical experiences, and research. The didactic courses taught by UIC and UM faculty are: Pharmacotherapeutics, Drug Information/Statistics, Pharmacoeconomics, and Health-Systems in US & Europe. Lectures are paired with case-based recitations and taught either in-person or via videoconferencing. Clinical experiences are acquired in pharmacy practice settings in Malta, including hospital, community, health-systems, and pharmacovigilance. The research component, mentored by UM and UIC faculty, focuses on applied practice research.

**JUSTIFICATION/DOCUMENTATION:** A cross-sectional survey performed in 2017 evaluated students' motivations for participation and satisfaction with the program and utility of the current curriculum. Of the 36 respondents (83.7% response rate), the majority of students were from Malta (77%) and practiced pharmacy for 6 years on average prior to Pharm.D. enrollment. Students noted improved knowledge and skills (69%) and increased job opportunities (28%) as their main motivations for enrollment. Students found the pharmacotherapeutics course to be the most difficult ($3.84 \pm 0.5$) but most satisfying ($4.5 \pm 0.9$) on a 5-point Likert scale (1=lowest, 5=highest). More than 90% felt prepared for clinical rotations.

**ADAPTABILITY:** The UM recognized the changing healthcare landscape, and with its excellence in Europe in clinical pharmacy education and research, took a lead to contribute internationally with UIC to the development of a patient-focused, professional doctorate. Through the wide range of expertise of UIC faculty, this hybrid teaching model provides a broad perspective of clinical specialization and merges European with US health-systems. International collaborations between colleges of pharmacy are possible through technology to equip pharmacists for clinical practice advancement.

**SIGNIFICANCE:** This educational model is useful for advancing clinical pharmacy practice, research, and education around the world, particularly in countries with limited access to clinical pharmacy faculty and expertise.

**526. Smart pharmacy program: changing practice by changing education** *Michael Rouse, BPharm(Hons)*[1], Arijana Meštrović, DrSc; MPharm[2]; [1]International Services Program, Accreditation Council for Pharmacy Education, Chicago, IL [2]PharmaExpert, Zagreb, Croatia

**SERVICE OR PROGRAM:** The SMART Pharmacy Program (*"Learn Today, Apply Tomorrow"*) is designed to be a sustainable, evidence-based initiative based on the CPD Model. Its objectives are to enhance practitioners' competence, expand their scope of practice, improve the quality of clinical services, and positively impact patient and population outcomes. Beyond building knowledge and skills, the Program addresses motivation and commitment to change. All stakeholders are invited to an initial workshop that includes a SWOT Analysis. National tools and frameworks are developed/adapted and trainers trained. Pharmacists are trained in CPD, other key principles and concepts, and a clinical module that can quickly and easily demonstrate measurable patient outcomes. Pharmacists self-assess their competence and quality of services, apply their learning to the care of patients, measure the results in a standardized way, and document everything in a portfolio.

**JUSTIFICATION/DOCUMENTATION:** What gets measured gets done. Turkish pharmacists are not required to do any CE to maintain their license; meaningful participation in CE is minimal. In many other countries, pharmacists are required to do CE, but may well do nothing beyond just "participating." The Program is designed to make learning more meaningful and impactful, and practice more viable.

**ADAPTABILITY:** Although based on globally adopted frameworks and principles, Program design and implementation is flexible and can be adapted according to national context and societal needs. Different entities – including national professional associations, the regulator, a hospital, the Ministry of Health – have led the Program, supported by ACPE and PharmaExpert.

**SIGNIFICANCE:** The Program has positively impacted individual pharmacists, national organizations, and patients. Since its launch in Turkey (2015), ± 3800 Turkish pharmacists have been trained in Asthma and ± 1200 in Diabetes. The Program has been implemented in six additional countries, with two more launching in 2018. Several other countries are anticipated to implement the Program soon.

**527. Establishing a collaborative international pharmacy practice experience in Vellore, India** *Alyssa Christensen, Pharm.D.*; Department of Pharmacy Practice, The University of Illinois College of Pharmacy, Rockford, IL

**SERVICE OR PROGRAM**: We report the development of a collaborative international pharmacy student rotation at the University of Illinois at Chicago (UIC) College of Pharmacy. An international advanced pharmacy practice elective experience will be offered to 4th year UIC students at the Christian Medical College (CMC) in Vellore, India, developed collaboratively with key stakeholders at CMC. CMC is a 3,000 bed academic medical center with 300 pharmacy department employees, 4 Pharm.D. faculty, and a growing clinical pharmacy service. **JUSTIFICATION/DOCUMENTATION:** Student activities will include medical intensive care unit rounding with a Pharm.D., performing medication counseling, investigating and evaluating adverse drug events, answering drug information questions, and participating in research aimed at evaluating the impact of pharmacy services at CMC. UIC faculty will with assist the growth of pharmacy services by aiding pharmacy practice research design and implementation, providing preceptor development and education, and offering mentorship for the pharmacy faculty at CMC. Success of the program will be measured by the expansion of clinical pharmacy services at CMC.

**ADAPTABILITY:** UIC faculty will accompany and precept UIC students on site. UIC faculty will work with CMC's Pharm.D.s by orienting and training them to act as preceptors when UIC faculty are absent. As clinical pharmacy services grow, UIC students will be offered additional rotation opportunities including a planned geriatrics medical service team. UIC faculty will collaborate with CMC faculty on research in efforts to grow pharmacy services and enhance student experiences.

**SIGNIFICANCE:** Pharmacy students and faculty will gain valuable experiences working alongside patients and healthcare providers of diverse backgrounds and exposure to medications and disease states not commonly encountered in the US. The experience will provide students and faculty with personal and professional development as well as improve cultural awareness and sensitivity. In return, UIC will provide guidance on strategies to enhance clinical pharmacy services at CMC.

**528. International advanced pharmacy practice experiences (APPE) in southern Africa: A focus on sustainable pharmaceutical care and public health interventions** Ashley Crumitie, Pharm.D.[1], *Miranda Law, Pharm.D.*[1], Imbi Drame, Pharm.D.[1], Shelter Mushipe, MPH[2], Henry Fomundam, Pharm.D.[2]; [1]Howard University College of Pharmacy, Washington, DC [2]Howard University Global Initiative South Africa (HUGISA), Hatfield, Pretoria, South Africa

**SERVICE OR PROGRAM:** Howard University College of Pharmacy (HUCOP) has developed a framework for the International Advanced Pharmacy Practice Experiences (APPE) in Southern Africa that allows student pharmacists to contribute to sustainable public health activities that positively impact local populations, and student development. The Howard University Global Initiative South Africa (HUGISA) is an HU regional office that was established in Pretoria, South Africa, to carry out health intervention projects in Southern and East African countries, which carry a disproportionately high prevalence of HIV/AIDS and other infectious diseases.[1,2] Under the supervision of a Howard University preceptor based in the regional office HUCOP student pharmacists receive a uniquely intense, concentrated, and rewarding international APPE experience.

**JUSTIFICATION/DOCUMENTATION:** The constant presence of an internationally based pharmacist in-country allows for rapid integration of student pharmacists into public health initiatives. Students work on projects funded by major US agencies, such as the CDC, PEPFAR, and USAID.[3,4,5] They play a first-hand role in advancing pharmaceutical care, the development of clinical tools for HIV/AIDS/TB, carry out operational research and give in-services on various topics, and projects managed by HU regional office.

**ADAPTABILITY:** The stable in-country presence of pharmacists allow for better understanding of global health care needs and especially health care challenges in the region. This creates opportunities for pharmacy interventions that meet the public health needs in the context of developing countries.

**SIGNIFICANCE:** This program allows for student exposure to pharmaceutical care and global challenges and further provides an opportunity for students to make vital contributions to sustainable public health solutions. Through these experiences, students and the populations they serve learn the value of pharmacists in advancing health care globally.

**529. Interprofessional education through a global health experience** *Donna Beall, Pharm.D.*[1], Jennifer Bell, DPT[2], Darin Bell, MD[3], Jacqueline Brown, Ph.D.[4]; [1]Skaggs School of Pharmacy, The University of Montana, Missoula, MT [2]School of Physical Therapy and Rehabilitation Science, The University of Montana, Missoula, MT [3]The Family

Medicine Residency of Western Montana, The University of Montana, Missoula, MT [4]School of Psychology, The University of Montana, Missoula, MT

**SERVICE OR PROGRAM:** Most professions require interprofessional education (IPE) training. A team of faculty from pharmacy, family medicine, physical therapy and psychology was formed to identify global opportunities for IPE. The objectives were to create an interprofessional experience for learners to increase experience with different health professions; create a global health experience in Gondar, Ethiopia for learners to gain a better understanding of different cultures; and to expose learners to the training and health care systems in under- served environments in developing countries.

**JUSTIFICATION/DOCUMENTATION:** The University of Montana has an established relationship with the University of Gondar (U of G). Faculty exchanges from the Colleges of Education. Humanities and Psychology set the framework. U of G was interested in expanding the relationship to health professions. An interprofessional team of faculty and learners from pharmacy, family medicine, physical therapy, and psychology was formed to visit Gondar and collaborate with its learners and faculty in the classroom and clinic/hospital.

**ADAPTABILITY:** Many programs can utilize interprofessional education in global health settings. Our results demonstrated that, despite different training programs and different levels of training, overall learners were ready for interprofessional learning prior to the trip. Learners were satisfied with the experience and reported they would recommend it to others.

**SIGNIFICANCE:** Learners spent three weeks in Gondar, Ethiopia working and learning in discipline-specific as well as interprofessional settings. Faculty were able to collaborate and have developed a formal mentoring program between the institutions.

**530. Integrated drug information and introductory principles of research course, Kingston, Jamaica** *Tyler Mullen, Pharm.D.*[1], Maxine Gossell-Williams, BSc, MPhil, Ph.D.[2], Cameil Wilson-Clarke, Pharm.D., MAT[2], Gene Morse, Pharm.D.[3], Gina M. Prescott, Pharm.D., BCPS[4]; [1]Center for Integrated Global Biomedical Sciences, Center of Excellence in Bioinformatics and Life Sciences, University at Buffalo, University at Buffalo, Buffalo, NY [2]Department of Basic Medical Sciences, University of the West Indies, Mona Campus, Kingston, Jamaica [3]Translational Pharmacology Core, Center of Excellence in Bioinformatics and Life Sciences, School of Pharmacy, University at Buffalo, Buffalo, NY [4]School of Pharmacy and Pharmaceutical Sciences, University at Buffalo, Buffalo, NY

**SERVICE OR PROGRAM:** A drug information and scientific literature review course was designed and implemented at The University of the West Indies (UWI), Mona Campus for post-baccalaureate Doctor of Pharmacy (Pharm.D.) students. The course was designed to provide skills needed to: (1) advance pharmacy practice, (2) advance health science research skills, and (3) comply with ACPE certification. An in-country, global health implementation fellow developed, coordinated and instructed the course. The course was modeled after a University at Buffalo (UB) pharmacy course and included a journal club presentation, ethics debate, written drug information response, and a midterm exam.

**JUSTIFICATION/DOCUMENTATION:** One of the goals of the UB-UWI Health Research Task Force is to catalyze the development of novel educational programs to increase capacity and advance healthcare in Jamaica. UWI has a newly developed Pharm.D. program and has the following unmet needs: (1) Pharm.D. trained faculty, (2) ACPE certification, and (3) research priorities. Nine students were enrolled and successfully completed the course. Topics successfully completed include: CITI training (Mean, A+), midterm (A), journal club (B+), debate (A), written consultation/response (B+). Most students needed further mentoring in scientific writing skills.

**ADAPTABILITY:** The UWI is a regional university throughout the Caribbean. This program can be provided to other UWI campuses or low and middle-income countries through utilization of distance learning and short term in person instruction. This approach facilitates training for Pharm.D. students and advancing introductory research skills, while maximizing utilization of qualified instructors through videoconferences. Concerns with availability and cost of drug information resources remain.

**SIGNIFICANCE:** The Jamaican Ministry of Health and the Pharmacy Council of Jamaica have stated that expanding the role of clinical pharmacists is integral for the continued growth of quality patient care in the Caribbean. Training students and pharmacists in drug information skills is essential for certification, optimal patient care, and developing researchers and patient-centered practitioners.

**531. Learning across borders: developing a pharmacist-driven continuing professional development program through the Baylor College of Medicine International Pediatric Aids Initiative Pharmacy Network (BIPAI-PN)** *Diane Nguyen, Pharm.D., BCPS*[1], Alexa Vyain, Pharm.D.[2], Rustin Crutchley, Pharm.D.[3], Amy Cheng, Pharm.D.[4], Michael Mizwa, BS in Finance[5]; [1]Department of Pediatrics, Baylor College of Medicine, Houston, TX [2]Department of Pharmacy Practice and Translational Research, University of Houston, Houston, PA [3]College of Pharmacy, Washington State University, Yakima, WA [4]Department of Pharmacy Practice, Temple University School of Pharmacy, Philadelphi, PA [5]Pediatrics, Baylor College of Medicine, Houston, TX

**SERVICE OR PROGRAM:** As the leading provider for pediatric HIV care and treatment in the world, BIPAI operates eight Centers of Excellence (COEs) and five satellite COEs in Botswana, Lesotho, eSwatini, Malawi, Uganda, Mbeya and Mwanza, Tanzania. The BIPAI-PN is a learning community enabling pharmacists and technicians to engage in opportunities to build capacity, improve operational and clinical pharmacy practice, share best pharmacy practices, identify peer points of contact for support and guidance, and resolve problems through collaboration and networking. The BIPAI-PN developed a continuing professional development (CPD) program in which pharmacy professionals can learn and collaborate by creating connections across organizational and geographical boundaries.

**JUSTIFICATION/DOCUMENTATION:** The BIPAI-PN conducted a needs-assessment and developed a pilot curriculum focusing on three

core components: supply chain management, clinical pharmacy practice, and pharmacy management and policy. The curriculum consisted of 17 pre-recorded learning modules, 10 corresponding live, web-based sessions designed to promote exchange of information and develop practice skills (e.g. facilitated discussion, case studies, journal club) and five elective modules. Quantitative outcomes included curriculum activity tracking (e.g. number of participants, modules, and live learning components), participant pre- and post-test scores, and curriculum completion rates. Qualitative outcomes were measured by surveying participants about individual learning modules and interactive components and also about their overall professional development.

**ADAPTABILITY:** The curriculum was primarily developed by U.S.-based pharmacists specialized in HIV, global health, and pediatrics with input from COE pharmacy professionals. The curriculum ran from November 2016 through April 2018. The curriculum materials were maintained on an online learning platform (Moodle), and an online videoconference tool (Zoom) was used to connect across countries.

**SIGNIFICANCE:** This CPD program has served as the basis for growth of the BIPAI-PN and enhanced the knowledge and skills of pharmacy professionals at the COEs as they continue to serve children and families.

**532. Development of an escape the room learning activity in a therapeutics course series** *Michael J. Gonyeau, BSPharm, Pharm.D., MEd, BCPS, FCCP*; School of Pharmacy, Northeastern University, Boston, MA

**SERVICE OR PROGRAM:** An escape room is a time-limited ludic game, team played, whose objective is to 'escape' from a challenge-filled room, encouraging students to think creatively and critically. There is a paucity of data regarding escape room designs in health education. Our objectives were to utilize an iterative process to create an immersive experience to stimulate and deepen knowledge, skills and attitudes while promoting collaboration in a live simulated setting in a Therapeutics seminar course.

**JUSTIFICATION/DOCUMENTATION:** A 1-hour open-path escape room developed with five puzzles integrating hyperlipidemia pharmacology, pathophysiology, and evidence-based therapeutics. Half(4) of the seminar sections experienced the activity, while the others utilized previously created materials and acted as a control group. To escape, students must construct an appropriate lipid-agent prescription based on a video-introduced patient. Pre- and post-surveys including opinion based and knowledge based items were administered. Exam performance was evaluated to detect any differences potentially attributable to the activity. Paired t-test was performed for student engagement, application of classroom knowledge, collaboration, and attitudes toward use of educational games. Single t-tests were used to determine any curricular value-added. Fisher's exact was used for knowledge based questions.

All 138 P2 students completed the pre-survey, and 58 (84%) students in intervention group completed the post-survey. Significant differences were observed in pre- vs. post-survey responses related to: working in groups (p=0.017) and effectiveness of educational games (p=0.013). Exam score analysis revealed a mean 5-point increase in Hyperlipidemia content scores in the intervention group (p=0.026)

**ADAPTABILITY:** Any pharmacy program could adopt these methods to develop an escape the room activity in a number of pharmacy course offerings.

**SIGNIFICANCE:** As constructed, escape rooms help develop skills in team working, creative problem solving and critical thinking. The inherent multi-modal and team-based mechanics increase likelihood of student engagement. The activity enhances student attitudes regarding collaboration/teamwork and applied knowledge confidence.

**533. An institute approach to international workshops intended to promote curricular change** *Janet Engle, Pharm.D.*[1], Joseph DiPiro, Pharm.D.[2], John Ressler, Ed.D[3], Michael Rouse, BPharm(Hons)[4]; [1]Pharmacy Practice, University of Illinois at Chicago, College of Pharmacy, Chicago, IL [2]Virginia Commonwealth University, Richmond, VA [3]American Association of Colleges of Pharmacy, Alexandria, VA [4]International Services Program, Accreditation Council for Pharmacy Education, Chicago, IL

**SERVICE OR PROGRAM:** Schools of pharmacy around the world are embarking on curricular change to ensure graduates have the knowledge and skills to provide clinical pharmacy services. This requires that curricula prepare graduates that are patient-oriented and possess competencies suitable to their changing roles in health care. This program was developed to help teams of 3 to 5 pharmacy faculty members and administrators from a university work together to identify opportunities for curricular change. Expert faculty lead participant teams through exercises to identify gaps in current didactic and experiential coursework, construct objectives for new educational experiences, and design new models of teaching, learning and assessment. Each team returns to their institution with plans for implementing curricular change that meets the local needs of their health care system. Topics for these workshops include curriculum design and delivery, assessment and experiential learning.

**JUSTIFICATION/DOCUMENTATION:** A needs assessment of schools in various regions of the world determined programmatic needs to enhance quality in pharmacy education. The results informed the development of topics for each offering. As participants work in teams from their own institution, plans are based on local need.

**ADAPTABILITY:** The program utilizes an "Institute" model where teams from each school work together to develop a plan for curricular change that meets local context and needs. As such, the program is adaptable to anyplace in the world. The program has been offered multiple times in the Middle East and Europe with offerings planned for other parts of the world.

**SIGNIFICANCE:** To date, over 200 faculty representing 60 schools and 23 countries have participated. Participant survey results have been very positive. Participants indicate that the concept of working in teams from the same institution during the conference enriched the experience and enabled them to go back to their institution with a concrete plan to implement curricular change.

**534. Development, validation and application of an inhaler technique competency assessment framework in pharmacy technicians in a local acute hospital in Hong Kong** *Gordon H. S. Miu, BPharm, MClinPharm*[1], Vicky W. K. Ling, Doctor of Pharmacy[1], Wilson Y. S. Leung, BPharm, Ph.D., BCPS[1], Esther W.Y. Chan, BPharm(Hons), MClinPharm, Ph.D., GradCertPharmEc[2]; [1]Department of Pharmacy, Queen Elizabeth Hospital, Hong Kong, Hong Kong [2]Department of Pharmacy, University of Hong Kong, Hong Kong, Hong Kong

**SERVICE OR PROGRAM:** An inhaler technique competency assessment framework was developed and validated by 3 BPS certified pharmacists from Queen Elizabeth Hospital and 2 academic pharmacists from the University of Hong Kong. A workshop on inhaler technique was established based on the framework. Pharmacy technicians were recruited for competency training and assessed at different time points pre- and post-training using the framework. Competent technicians, defined as obtaining ≥95% of total score post-training, are qualified to educate patients at outpatient pharmacy.

**JUSTIFICATION/DOCUMENTATION:** There is a demand for inhaler education for patients in local hospitals. However, variations in inhaler technique were reported in literature and suboptimal technique was observed among local technicians. Therefore, establishing competency is important. Twelve technicians were recruited. All failed the baseline assessment [MDI: 55.2±11.8, MDI+Aerochamber: 65.8±9.2, Accuhaler: 54.2±15.0, Turbuhaler: 36.8±14.3, Handihaler: 63.1±8.5, Soft Mist inhaler: 16.4±16.3, Breezhaler: 70.5±9.7, Ellipta inhaler: 42.3±20.5]*. After training, inhaler technique was significantly improved [MDI: 99.31±1.03, MDI+Aerochamber: 98.3±2.1, Accuhaler: 95.8±3.4, Turbuhaler: 98.0±2.2, Handihaler: 99.7±0.7, Soft Mist inhaler: 98.9±1.8, Breezhaler: 99.7±0.6, Ellipta inhaler: 100.0±0, $p<0.01$ for all pairs]*. Technicians were subsequently reassessed 1-, 6-, and 12-month post-training to determine the optimal interval of revalidation. Competency was maintained up to 1 year given that technicians practised at work. (*Marks out of 100)

**ADAPTABILITY:** Healthcare professionals were frequently reported to be incompetent on inhaler technique. Use of this framework does not require specialist skills; thus it can be widely adopted for training technicians, pharmacists, nurses and physicians who need to educate patients on inhaler technique in community and hospital settings.

**SIGNIFICANCE:** An inhaler technique assessment framework has been established. This not only improves the quality of care but also enhances the professional development of pharmacy technicians and spares pharmacists for provision of advanced clinical services. A training and assessment model has been established that can extend to other medications with specific handling technique.

**535. Bridging international and local global health through the Baylor College of Medicine International Pediatric Aids Initiative Pharmacy Network (BIPAI-PN) Conference** *Diane Nguyen, Pharm.D., BCPS*[1], Elizabeth Flatley, Pharm.D.[2], Katherine Wang, Pharm.D.[2], Amy Cheng, Pharm.D., BCACP, AAHIVP[3], Kemi Osundina, Pharm.D.[4], Yen Phan, Pharm.D.[2]; [1]Department of Pediatrics, Baylor College of Medicine, Houston, TX [2]Texas Children's Hospital, Houston, TX [3]Department of Pharmacy Practice, Temple University School of Pharmacy, Philadelphia, PA [4]Rutgers, The State University of New Jersey, Lawrenceville, NJ

**SERVICE OR PROGRAM:** As a leading provider for pediatric HIV care and treatment, BIPAI operates eight Centers of Excellence (COEs) and five satellite COEs in Botswana, Lesotho, eSwatini, Malawi, Uganda, Mbeya and Mwanza, Tanzania. The BIPAI-PN is a learning community enabling pharmacists and technicians to engage in opportunities to build capacity, improve operational and clinical pharmacy practice, share best practices, identify peer points of contact for support and guidance, and resolve problems through collaboration. The BIPAI-PN hosted its first Global Pharmacy Conference in Johannesburg, South Africa, November 6-10, 2017 to further these objectives.

**JUSTIFICATION/DOCUMENTATION:** Seventeen pharmacists across the BIPAI-PN, Texas Children's Hospital, and U.S. colleges of pharmacy participated. The program included didactic sessions and workshops focusing on supply chain management, clinical pharmacy practice, and pharmacy management and leadership; best practice sharing; and networking. The impact of sessions on knowledge was measured by administering pre- and post-tests, and the quality of sessions was assessed by participant evaluations. The extent to which relationships were established have been measured by use of the BIPAI-PN liserserv, social media communication application (Whatsapp group) and collaboration between individuals and sites.

**ADAPTABILITY:** The conference leveraged the experiences of U.S-based pharmacists and Africa-based pharmacists to create an active learning process among those working in underserved communities locally and internationally. The U.S.-based pharmacists primarily drove the process for preparing and facilitating conference activities. However, they were paired with COE pharmacists to dialogue and ensure appropriate adaptation of content to resource-constrained settings and facilitate joint sessions.

**SIGNIFICANCE:** The conference was designed to increase pharmacists' technical knowledge and skills of clinical pharmacy practice and further strengthen the BIPAI-PN. It has fostered quality improvement projects between COE and U.S. pharmacists that have enhanced pharmacy operations, developed a more clinical role for COE pharmacists, and promoted the pharmacists' integration into the medical team.

**536. International scholars program: advancing clinical pharmacy practice and education globally** *Roger Lander, BSPharm, Pharm.D., FCCP, FASHP, BCACP*[1], Michael Hogue, Pharm.D., FAPhA, FNAP[2], Michael Thomas, Pharm.D., BCPS, FCCP[3]; [1]Pharmacy Practice Department, McWhorter School of Pharmacy, Samford University, Birmingham, AL [2]Department of Pharmaceutical, Social, and Administrative Sciences; McWhorter School of Pharmacy, College of Health Sciences, Birmingham, AL [3]Department of Pharmacy Practice, McWhorter School of Pharmacy; College of Health Sciences, Birmingham, AL

**SERVICE OR PROGRAM:** Provide a program of 10 – 14 days duration for pharmacists and pharmacy students from different countries to come to the US and learn about clinical practice and education in the

US, as well as to learn from each other through shared experiences. Programming consists of patient care, development of clinical practice, clinical education methods, and simulated experiences.

**JUSTIFICATION/DOCUMENTATION:** From 1994 through 2012, our school had hosted approximately 350 students and pharmacists for observational study programs. Most participants during that time had experiences ranging from observational (2 weeks) to immersive 'mini-residency' type experiences of up to 5 months duration. Participants were mainly from Asia, including Japan, S. Korea, China, Indonesia, Malaysia, Vietnam, and Singapore. With a desire to expand our offering to a wider geographic region and because of an increasing difficulty placing scholars in practice sites, we decided to design a program that would provide introduction and training to clinical practice and education in a way that maintained our original goals yet was achievable with the growing restrictions on clinical practice placements. Beginning in 2013 and continuing through the 2018 summer, we have now offered this newly formatted program to 71 participants from ten different countries, five of which we had no previous affiliation.

**ADAPTABILITY:** Our program includes an introduction to the US pharmacy education system and patient-centered care process, and we utilize our clinical simulation center for patient and inter-professional interaction. Scholars visit community pharmacy sites and participate in a number of cultural enrichment activities in our city. Other schools could easily adapt our program for their use.

**SIGNIFICANCE:** We have received very positive feedback from all participants to date both after completion of the conference as well as many comments about their utilization of the information/skills learned after returning to their home country. We plan to continue this annual program.

**537. Evolution of an experiential focused pharmacy education program within Eldoret, Kenya** Monica L. Miller, Pharm.D., MS[1], Rakhi Karwa, Pharm.D.[2], Ellen Schellhase, Pharm.D.[1], Sonak Pastakia, Pharm.D., MPH, Ph.D.[3], Beatrice Jakait, Pharm.D.[4], Victor Kipyegon Maina, BPharm[5], Gabriel Kigen, BPharm, Ph.D.[6], Imran Manji, BPharm, MPH[7], *Susie Crowe, Pharm.D., BCPS*[8], Dan Tran, Pharm.D.[3]; [1]Department of Pharmacy Practice, Purdue University College of Pharmacy, West Lafayette, IN [2]Department of Pharmacology, Moi University, Eldoret, Kenya [3]Department of Pharmacy Practice, Purdue University College of Pharmacy / Purdue Kenya Partnership, Eldoret, Kenya [4]AMPATH, Eldoret, Kenya [5]Moi Teaching and Referral Hospital, Eldoret, Kenya [6]Pharmacology, Moi University, Eldoret, Kenya [7]Department of Pharmacy, Academic Model Providing Access to Healthcare (AMPATH), Eldoret, Kenya [8]East Tennessee State University, Johnson City, TN

**SERVICE OR PROGRAM:** Purdue University College of Pharmacy (PUCOP) has been a member of the AMPATH consortium which includes Moi Teaching and Referral Hospital (MTRH) and Moi University since 2003. PUCOP couples bilateral partnership with advancing patient care, education and research. The initial education program focused on experiential training for PUCOP students and Kenyan trained pharmacy interns who provided care on adult medicine wards with an international, interprofessional team. The demonstrated success of the Kenyan pharmacist intern's abilities to apply knowledge and impact patient-centred care led the PUCOP team to expand and advance experientially focused training opportunities within Kenya. In this effort, an experiential based residency, Post-Graduate Diploma program (PGD) and Masters of Clinical Pharmacy (MS) program were developed in partnership with local partners.

**JUSTIFICATION/DOCUMENTATION:** Although the positive impact of clinical pharmacists on patient outcomes is well documented in high-income countries, this data is lacking for low and middle-income countries (LMIC) likely due to challenges including poor essential medicine availability and healthcare worker shortages. The education programs mentioned above aimed to train pharmacists how to address these challenges and improve patient care. There have been, 50 interns, 15 PGD graduates, 7 currently enrolled MS students, and 216 PUCOP students trained within the individual education programs. Of these, seven have been retained as clinical pharmacists that have developed and maintained nine new patient care services which have directly impacted 12,000 patients yearly. To house these programs, MTRH established the first Clinical Pharmacy Unit at a public-sector hospital within Kenya.

**ADAPTABILITY:** Each program has been recognized by the Kenyan Pharmacy and Poisons Board and Moi University, allowing for replication throughout Kenya and other LMIC countries looking to advance patient care opportunities.

**SIGNIFICANCE:** This education model has significantly advanced clinical pharmacy practice within Kenya through an impactful experiential training program that builds learners at various stages in their careers.

**538. Creation of a novel interprofessional global health certificate** *Emily Flores, Pharm.D.*[1], Megan Quinn, DPH[2], Susie Crowe, Pharm.D.[3], Meira Yasin, DNP[4], Jackson Williams, MD[5]; [1]Department of Pharmacy Practice, East Tennessee State University Bill Gatton College of Pharmacy, Johnson City, TN [2]East Tennessee State University College of Public Health, Johnson City, TN [3]East Tennessee State University Bill Gatton College of Pharmacy, Johnson City, TN [4]East Tennessee State University College of Nursing, Johnson City, TN [5]East Tennessee State University James Quillen College of Medicine, Johnson City, TN

**SERVICE OR PROGRAM:** Global health opportunities at East Tennessee State University have grown through collaboration of Academic Health Sciences Center interprofessional faculty, resulting in new didactic and experiential courses, a Global Health Certificate, and development of clinical and research partnerships. In developing global health collaborations, faculty seek to be patient-centered, community-guided, capacity-building, interprofessional, and sustainable. The interprofessional Global Health Certificate was developed to provide a strong educational foundation for global health interested students at ETSU while providing an opportunity to expand patient-care collaborations abroad.

**JUSTIFICATION/DOCUMENTATION:** The Global Health Certificate requirements include foundational didactic courses, a field placement

preparatory course, and a seminar course, all of which are interprofessional. Additional courses and a field placement allow for profession-specific education and development of individual interests. Courses in the Certificate are asynchronous online, blended, seated, or travel courses and incorporate significant active learning and cultural immersion activities. Development of a collaboration in Mbarara, Uganda has been prioritized for field placement development. This collaboration is initiative-based seeking to advance patient-care and clinical pharmacist education and practice in Mbarara, Uganda through efforts of USA and Ugandan pharmacy students, interns, faculty, and clinical pharmacists.

**ADAPTABILITY:** A similar Certificate could be implemented interprofessionally or as a pharmacy-only offering in any interested University with work from global health interested faculty advocates, collaborators for quality Global Health field experiences, and administrative support for course approvals and funding. Challenges are curricular coordination, faculty time, and coordination of efforts.

**SIGNIFICANCE:** Global health training for pharmacists is a significant need as development of the clinical pharmacist workforce worldwide is prioritized. A Global Health Certificate provides a package of training for the future pharmacist; an interprofessional Global Health Certificate provides additional insights to be a successful team member through development of the interprofessional competencies of roles/responsibilities, teams/teamwork, values/ethics, and interprofessional communication.

**539. Joint international course for pharmacy students in taiwan and the us** *Chelsea Pekny, Pharm.D.*[1], Elizabeth Chang, Pharm.D., Ph.D.[2], Hsiang-Wen Lin, MS, Ph.D.[3]; [1]College of Pharmacy, The Ohio State University, Columbus, OH [2]School of Pharmacy, College of Pharmacy, Taipei Medical University, Taipei City 11031, Taiwan [3]School of Pharmacy and Graduate Institute, China Medical University, Taichung, Taiwan

**SERVICE OR PROGRAM:** Joint international course for pharmacy students in Taiwan and the US

**JUSTIFICATION/DOCUMENTATION:** As the focus on active learning models and student interest in global experiences increases, an opportunity exists for collaboration between international partners to provide interactive courses for student pharmacists. Since 2015, one US and two Taiwan institutions have partnered to deliver an elective course centered on live videoconference among the institutions. The course has focused on pharmacy practice similarities and differences in care delivery between the US and Taiwan. Each year a course theme is selected; past examples include smoking cessation, drug abuse, and geriatric medication use. Recently, a component of regular virtual interaction has been added where students can have online discussions throughout the course about pharmacy education, health care system, or the course theme of the year. This model provides a unique opportunity for international engagement. First, it provides a regular, real-time interaction between students in cases where interaction can be limited by funding and timing constraints. Second, it provides up to date information about a specific pharmacy practice topic for pharmacy students at varying levels. Finally, it provides an opportunity for students at each institution to collaborate in the creation of a presentation, which they utilize to teach the other partner institutions and participate in a question and answer session during a 3-hour interactive videoconference. To date, over 30 students from the US and 60 students from Taiwan have participated in the videoconference, as well as faculty and administrators from each institution.

**ADAPTABILITY:** To facilitate this course, technology utilized included online, multi-country accessible discussion boards and equipment with videoconferencing capabilities.

**SIGNIFICANCE:** The videoconference experience gives professional pharmacy students the ability to interact with peers around the world to discuss timely pharmacy practice topics in a sustainable, accessible fashion, and can be a first step in building larger collaborations.

**540. Needs assessment for pgy1 preceptors' professional development: a cross-sectional study** *Sara Mahmoud, Pharm.D., BCCCP*[1], Rasha Al Anany, Pharm.D.[2], Wessam Elkassem, B.Sc., MBA, Pharm. D.[2], Moza AlHail, Bsc (Pharm), PgDip[2], Jodie Malhotra, Pharm.D.[3]; [1]Emergency Medicine, Surgery, Hamad Medical Corporation, Doha, Qatar [2]Hamad Medical Corporation, Doha, Qatar [3]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy, Aurora, CO

**SERVICE OR PROGRAM:** PGY1 Residency program (ASHP accredited), Hamad Medical Corporation, Qatar

**JUSTIFICATION/DOCUMENTATION:** To ensure excellence in experiential programs, it is important to invest in preceptors' professional development. As per the current evidence, there isn't enough data or well-constructed guides to aid professional development for residency preceptors

This survey was conducted to measure the competency of PGY1 pharmacy residency preceptors in Hamad Medical Corporation, Qatar, which is ASHP accredited.

**ADAPTABILITY:** A comprehensive literature review was conducted and translated to a preceptor development assessment rubric. The rubric was then depicted in a form of survey to measure the confidence and proficiency of preceptors. The survey consisted of 16 questions focusing on: being a pharmacy role model, teaching skills and models, communication, professionalism, research and others.

**SIGNIFICANCE:** Preceptors showed high confidence in being pharmacy role models and being able to motivate residents. However, there was a deficiency in being able to transition between different teaching models such as coaching and facilitating. Preceptors also reported that they require improvement in teaching management skills, time management and critical conversation.

On a global level, it has been found that preceptor development requires significant improvement especially for pharmacy residency programs. In HMC, there are multiple areas for improvement such as: teaching strategies, writing feedback and presentation skill.

## EMERGENCY MEDICINE

**541. Establishment of pharmaceutical services within the emergency department** Graziella Portelli, M. Pharm[1], *Lilian M. Azzopardi, BPharm. (Hons.). MPhil., Ph.D.., MRPharmS, FFIP*[2], Louise Grech, B.Pharm (Hons), MPhil, Ph.D, MRPharmS[3]; [1]Materi Dei Hopsital, Msida, Malta [2]Department of Pharmacy, University of Malta, Msida, Malta [3]Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Msida, Malta

**SERVICE OR PROGRAM:** Establishment of pharmaceutical service tailored to the need of the Adult Emergency Department (ED) in Mater Dei Hospital(MDH). The service was provided by one pharmacist, covering weekdays from 07:30 to 15:00.

**JUSTIFICATION/DOCUMENTATION:** This service was absent in MDH, the main hospital and level one trauma centre in Malta. The innovation was to prioritise on the services to be provided in a setting where the medical and nursing team were requesting pharmaceutical support in diverse and multiple aspects.

**ADAPTABILITY:** ED dynamics on the medication use processes were observed for 3 weeks during a gap analysis. Concurrently, familiarisation with ED physicians and nurses (55 and 87 respectively) and a validated questionnaire was disseminated to determine their perspectives on the expections from the pharmacist in the ED department. Thegap analysis and questionnaire findings (52% response rate from physicians and 53% from nurses) supported by international guidelines served as a blueprint for the establishment of an ED pharmaceutical service, categorised into operational, clinical and others. Following validation with key management people (from MDH ED and Pharmacy) this service started on March 2017

**SIGNIFICANCE:** Operational services were primarily set up with ED medication stock management of a centralised floor-stock pharmacy model; 4 new drugs were added on the floor stock, 3 changes were implemented on Formulary List, reorganisation of medication cabinets was carried out where high alert drugs identified, Tall-Man lettering labelling and identification of light sensitive drugs were implemented. Antidotes hazard vulnerability exercise was carried out to determine the official antidote list. Clinical services were started in November 2017 and over a 3 month period, 150 clinical pharmacy interventions were documented and the ED pharmacist participated in 10 cardiopulmonary resuscitation cases and in 4 national major events. Four departmental policies related to medication use were written. Pharmacology lectures to nursing staff were delivered.

## HEALTH SERVICES RESEARCH

**542. Implementation of a pharmacist-led transitional care service at an acute general hospital** Denise Borg, B.Sc. Pharm. Sci. (Hons.) M. Pharm[1], Louise Grech, B.Pharm (Hons), MPhil, Ph.D, MRPharmS[1], *Lilian M. Azzopardi, BPharm. (Hons.). MPhil., Ph.D.., MRPharmS, FFIP*[2]; [1]Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Msida, Malta [2]Department of Pharmacy, University of Malta, Msida, Malta

**SERVICE OR PROGRAM:** An innovative patient-centred pharmaceutical service was devised for patients who are transitioning from an acute general hospital to other clinical settings. Holistic and tailored interventions were delivered by a hospital pharmacist at Mater Dei Hospital in Malta following an observational phase. These interventions centred around: customised patient counselling, validation of discharge information by providing a clinical check, medication reconciliation and supply of medications at discharge.

**JUSTIFICATION/DOCUMENTATION:** Targeted pharmaceutical interventions allow for identification of potential medication errors and promotes the interdisciplinary approach towards ensuring continuity of care. This patient-specific service targeted a previously unexplored niche by clinical pharmacists in Malta and focuses on patients during the transitional phase of hospital discharge.

**ADAPTABILITY:** The service was incepted by allocating a pharmacist to perform transitional care roles. A pager system was devised which enables healthcare professionals to flag patients to the pharmacist to perform advanced pharmaceutical interventions. A model of task allocation was facilitated with the enactment of a multidisciplinary standardised operating procedure governing the processes at discharge. This service model can be replicated by other institutions globally by engaging pharmacists to perform transitional care initiatives to promote patient safety.

**SIGNIFICANCE:** The successful implementation of the discharge service highlights the leadership roles clinical pharmacists can embark on during transitional care. This innovative service consisted of bundled pharmaceutical interventions and throughout a twelve-month period from service inception, 791 discharged patients benefitted from these interventions. This corresponds to approximately 20% of patients discharged through the study setting. A pilot medication reconciliation service was performed for 196 discharged patients to gauge expansion in the service provision.

**543. Patient perspectives on medication self-management in rural Kenya: A cross-sectional survey** *Erika Kim, Pharm.D. Candidate*[1], Vicki Ellingrod, Pharm.D., FCCP[2], Peter Ndege, M.B, Ch.B, M.Med (Intern Med.), PGD-STI, PGD-Inf Ds[3]; [1]University of Michigan College of Pharmacy, Ann Arbor, MI [2]Clinical Pharmacy Department, College of Pharmacy, University of Michigan, Ann Arbor, MI [3]Eastern Community Medical Consultants Clinic, Meru, Kenya

**SERVICE OR PROGRAM:** The Michigan Institute for Clinical and Health Research Global Summer Clinical Research Program, with Kenya Methodist University, provided the opportunity for pharmacy students to conduct an international medication use study on chronic illness patients in Meru, Kenya. A cross-sectional prospective community survey was held at a local Kithoka dispensary and the government operated Meru Level 5 Hospital.

**JUSTIFICATION/DOCUMENTATION:** Medication management is crucial as the growth of HIV, tuberculosis, and noncommunicable diseases result in a double burden of disease in the East African community. Most studies on medication use focus on urban Nairobi and western Kenya, leading to a lack of knowledge on rural regions that make up 75% of the

population. Between June and July 2016, 75 chronic illness patients in rural Meru County completed the 12-question Measures of Drug Self-Management Scale (MeDS) survey. A score of 10 or more defined "adequate" drug self-management. The average MeDS score was 8.16±2.4, showing inadequate medication self-management. There were no significant differences across age and gender. Minor side effects and the idea that taking medicines disrupt life were highly associated with poor medication self-management ($r$ = 0.58). Forgetfulness and poor medication self-management had the highest correlation ($r$ = 0.64). 64% agreed that they have a hard time paying for their medicines.

**ADAPTABILITY**: All questions on the MeDS survey had statistically significant correlations with medication self-management. The survey was completed in English, an official language of Kenya. It can be implemented in other rural East African communities to determine baseline rates and identify barriers to adequate medication self-management.

**SIGNIFICANCE:** Most patients in this rural Kenyan population do not have adequate medication self-management. The MeDS questionnaire is a practical tool that can identify barriers to medication self-management in rural populations and may indicate areas for pharmacists to develop educational resources.

**544. Global outreach through clinical services and educational programs in a rural community in Vietnam** Hoai-An Truong, Pharm.D., MPH and *Yen Dang, Pharm.D., CTTS-M*; School of Pharmacy and Health Professions, University of Maryland Eastern Shore (UMES), Princess Anne, MD

**SERVICE OR PROGRAM:** An academic-community partnership for a clinical and educational program aimed to provide primary care services to reduce cardiopulmonary morbidity/mortality in a Vietnam rural community. The approach was to implement a 3-pronged approach, including providing primary care for patients, training clinic staff, and educating the community. Educational training consisted of lectures and hands-on activities focusing on risks, symptoms, treatment and prevention strategies. Clinical services included assessment and treatment of cardiopulmonary diseases and dispensing of medications.

**JUSTIFICATION/DOCUMENTATION:** The team included healthcare professionals and students in medicine, nursing, pharmacy, and public health in the United States and Vietnam. Volunteers collaborated to provide primary care, medications, and health education. The focus was on stroke, chronic obstructive pulmonary disease (COPD), and smoking cessation, as these are leading causes of death in Vietnam. The team provided primary care and medications for 1320 patients, averaging 50 years of age with 3 medical conditions per patient and educated 561 patients. Participants (100% and 90.4%) surveyed after program completion agreed that improving lifestyle factors decreased their risk for cardiovascular disease and COPD, respectively.

**ADAPTABILITY:** Providing global health service in an interprofessional international rural community clinic enabled volunteers to educate and care for diverse populations, gain real-world experiences, and learn lessons for future missions. Forty-four trained clinic staff would be responsible for continuing the clinical educational services after the mission. This program enhanced clinical pharmacy services in rural settings and could be replicated in similar global settings.

**SIGNIFICANCE:** Global health service includes provision of health education and medical mission to improve health equity for people worldwide. The implementation of this program was the first of its kind in this rural setting. It utilized an interprofessional team approach led by clinical pharmacists to train clinic staff for sustainability and management of chronic diseases.

## OTHER

**545. Enhancing over-the-counter medication knowledge for pharmacists in Goa, India** *Golden Peters, Pharm.D., BCPS*; Saint Louis College of Pharmacy, Saint Louis, MO

**SERVICE OR PROGRAM:** In 2014, a partnership was formed between Goa College of Pharmacy (GCP) and St. Louis College of Pharmacy (STLCOP). This is a developing partnership focused on the implementation of over-the-counter (OTC) medication education programing for members of the Goa Pharmacist Association (GPA). GPA has bi-monthly meetings/workshops for local pharmacists where OTC medications are presented to expand the knowledge of their members. There are pre and post-tests to assess attendee's knowledge.

**JUSTIFICATION/DOCUMENTATION:** OTC medications in India are not readily available as OTC products. They are typically stored behind the counter and usually require a prescription prior to dispensing. In India, pharmacy leaders are making progress in re-classifying some OTC products and moving the product from behind the counter. This shift requires pharmacists in Goa, India to become knowledgeable and confident in providing OTC/self-care recommendations for their patients.

**ADAPTABILITY:** This project is being led by pharmacy leaders within the local community. Their guidance allows STLCOP faculty to build the OTC course-work. The list of OTC medications seeking re-designation in India was prioritized by local pharmacy leaders. This service could easily be adopted by other pharmacy organizations within India or other international locations to increase the knowledge-base of local pharmacists on OTC products or other relevant pharmacy topics. The vital ingredient for success is having key stakeholders within the local community take ownership of the project, invest time, and assume leadership roles within the project.

**SIGNIFICANCE:** This project is filling a significant educational gap within this community. Currently there is not OTC medication content within the GCP curriculum. There are plans within Goa and throughout India to re-classify many products as OTC medications, which would allow patients to receive these products without prescriptions. This project is aiming to fill a knowledge gap that currently exists for pharmacists in India regarding OTC/self-care recommendations.

**546. Pharmacist contribution to medical brigade in rural honduras** *Olivia Caron, BS*, Danielle Hess, BS and Benjamin Van Tassell, Pharm.

D.; School of Pharmacy, Virginia Commonwealth University, Richmond, VA

**SERVICE OR PROGRAM:** Team-based care is an essential component of Global Health efforts. Herein we describe the pharmacy contributions to a multi-disciplinary medical brigade in Honduras.

**JUSTIFICATION/DOCUMENTATION:** The brigade travels to a rural community near Olanchito, Yoro, Honduras. The brigade sets up side-by-side clinics for adult and pediatric patients for 3 days in a central village (La Hicaca) and for 2 days in a remote village (Lomitas). Over the course of these 5 days, the team sees approximately 900 patients.

**ADAPTABILITY:** The team consists of 1 attending pharmacist, 2 student pharmacists, 1 attending pediatric physician, 1 attending internal medicine/infectious disease physician, 2 pediatric resident physicians, 4 internal medicine residents, 1 epidemiologist, 2 laboratory technicians, 6 medical students, 1 nurse practitioner, and 3 nurses.

Upon arrival, patients are registered into the clinic and receive an individual flow sheet. Patients then rotate through 5 stations, each of which focuses on a different organ system. Commonly used medications are packaged into sandwich bags for distribution at the corresponding stations (see Table).

| Drug | Dose | Directions | Quantity |
|---|---|---|---|
| Albendazole | 400 mg | daily x 3 days | 2700 |
| Acetaminophen | 325 mg | PRN x 90 tabs | 40000 |
| Acetaminophen | 500 mg | PRN x 90 tabs | 24625 |
| Acetamimophen | 160 mg/5 mL | PRN x 120 mL | 201 |
| Ibuprofen | 200 mg | PRN x 90 tabs | 51360 |
| Ibuprofen | 100 mg/5 mL | PRN x 120 mL | 47 |
| Multivitamins | Adult | daily x 30 days | 10120 |
| Multivitamins | Prenatal | daily x 90 days | 14955 |
| Multivitamins | Children | daily x 14 days | 12915 |
| Ranitidine | 150 mg | twice daily x 14 days | 9050 |

Additional medications are prescribed as needed on the patient flow sheet and dispensed at the pharmacy station: amoxicillin (chewable tablet/capsule/suspension), atenolol, bacitracin, cefixime, cephalexin, ciprofloxacin, clindamycin, clotrimazole (topical), doxycycline, enalapril, fluconazole, metformin, metronidazole, prednisone/prednisolone, and triple antibiotic cream.

**SIGNIFICANCE:** This brigade provides a practice model for multidisciplinary care in rural medical brigades.

**547. International masterclass as a catalyst to expand interprofessional learning (IPL) and interprofessional practice (IPP) in Ireland** *McKenzie Calhoun, Pharm.D.*, Brian Cross, Pharm.D., Debbie Byrd, Pharm.D., Larry Calhoun, Pharm.D.; ETSU Bill Gatton College of Pharmacy, Johnson City, TN

**SERVICE OR PROGRAM:** International Masterclass as a Catalyst to Expand Interprofessional Learning (IPL) and Interprofessional Practice (IPP) in Ireland.

**JUSTIFICATION/DOCUMENTATION:** A masterclass symposium titled, "*The Journey to Team-Based Healthcare*", was jointly hosted by the Royal College of Surgeons in Ireland (RCSI), the Irish Institute of Pharmacy and East Tennessee State University (ETSU). It was designed for, and attended by, Irish healthcare professionals, policy makers and academicians with the ultimate goal of determining future directions for the implementation of IPL/IPP in Ireland. The masterclass provided an overview of IPL and IPP processes at ETSU presented by faculty from pharmacy, medicine and nursing. Post-masterclass engagement included: ETSU delegation meeting with accreditation and licensing oversight organizations and participation in a national podcast to ignite conversation toward advancing ambulatory clinical pharmacy practice in Ireland.

**ADAPTABILITY:** The IPL/IPP masterclass symposium approach was subsequently implemented in Aberdeen, Scotland in a partnership between Robert Gordon University and ETSU with the goal of determining future directions for IPL/IPP in Scotland and would be beneficial in other developed countries.

**SIGNIFICANCE:** Secondary to relationships forged between RCSI and ETSU during the masterclass symposium process, a Fulbright Scholarship application was submitted, and funded for a faculty representative from ETSU to spend 3 months in Ireland to be involved in furthering IPL/IPP processes in the country. This experience will include involvement in the creation of IPL experiences and their assessment, involvement with research assessing the use of pharmacists within primary care practice areas, and engagement with licensing organizations to help develop standards required to assess quality of care by pharmacists provided in primary care practice settings. The opportunities already realized and the future works planned and in progress demonstrate the value of creating settings, such as an international masterclass, that serve as catalysts for IPL/IPP advancement.

## RESEARCH AND SCHOLARSHIP ACADEMY ORIGINAL RESEARCH

## AMBULATORY CARE

**548. Addition of a quit and win program to intensive smoking cessation therapy** *Kirk Evoy, Pharm.D.*[1], Kentya Ford, DrPH, MS[2], Amber Taylor, Pharm.D.[3], Sabina Nduaguba, Ph.D. Candidate[2]; [1]The University of Texas at Austin College of Pharmacy and University of Texas Health San Antonio Long School of Medicine, San Antonio, TX [2]Health Outcomes and Pharmacy Practice, University of Texas at Austin College of Pharmacy, Austin, TX [3]University of Texas at Austin College of Pharmacy, Austin, TX

**INTRODUCTION:** Quit and Win programs utilize potential rewards (e.g., money, vacations) to incentivize smoking cessation. Such programs have been shown to improve cessation rates by up to 15.9%. However, few studies have combined Quit and Win programs with intensive smoking cessation programs including behavioral counseling and pharmacotherapy.

**RESEARCH QUESTION OR HYPOTHESIS:** Does adding a financial incentive (through a "Quit and Win" contest) to behavioral counseling and pharmacotherapy (intervention) improve smoking cessation rates versus behavioral counseling and pharmacotherapy alone (control)?

**STUDY DESIGN:** This was a single-center prospective, open-label controlled clinical study.

**METHODS:** During a 6-month active recruitment, current smokers received pharmacist-led behavioral counseling (30-minute, one-on-one, face-to-face cessation counseling; encouraged to attend ≥3 sessions) and smoking cessation pharmacotherapy (medications obtained through prescription, not provided for free; patients could decline pharmacotherapy). Additionally, active-group patients that successfully quit (verified by self-report and exhaled carbon monoxide <10ppm) at 1-month and 3-month post-quit-date received entry into a drawing for a single $1,000 cash reward. For 3 months following the active phase, the control group received the same pharmacist-led smoking cessation services but without an opportunity to win $1,000.

**RESULTS:** Total enrollment was 111 patients (n=85 and 26 in the treatment and control groups, respectively). Eighty-five percent used cigarettes only, 2% cigars only, and 10.8% both cigarettes and cigars with 56% using 11 to 20 tobacco units per day. Quit rates at 1 and 3 months were, respectively, 29% and 32% in the treatment group and 19% at both time points in the control group. This was however not statistically significant (p=0.22). Female gender (Odds Ratio (OR) =2.84, 95% Confidence Interval (CI)=1.15-6.97) and Fagerström score (OR=0.71, 95% CI=0.57-0.88) were significant predictors of quit rate.

**CONCLUSION:** The Quit and Win program increased clinic referrals (i.e., increased the number of patients trying to quit) and numerically improved cessation rates, though unexpectedly high study attrition prevented observation of statistically significant differences.

## CARDIOVASCULAR

**549. Effect of statin combination therapy on prevention of cardiovascular disease in high-risk diabetic patients** Meredith Sigler, Pharm. D., BCPS[1], *Courtney Duval, Pharm.D., BCACP*[2], Trang Nguyen, Pharm. D.[3], Carlos Alvarez, Pharm.D., M.Sc., BCPS[4], Lisa Chastain, Pharm.D., BCACP[5]; [1]Pharmacy Practice, TTUHSC SOP, Dallas, TX [2]Texas Tech University School of Pharmacy, Dallas, TX [3]VA North Texas Healthcare System, Dallas, TX [4]School of Pharmacy, Texas Tech University Health Sciences Center, Dallas, TX [5]Pharmacy Practice – Ambulatory Care Division, Texas Tech University Health Sciences Center, Dallas, TX

**INTRODUCTION:** Diabetic dyslipidemia is highly atherogenic, leading to a high risk for cardiovascular disease (CVD). Studies have evaluated addition of non-statin therapy compared to statin monotherapy for prevention of CVD; however, no studies have compared statin with fibrate to statin with other non-statin therapy (bile acid sequestrants, ezetimibe, niacin, omega-3 fatty acids).

**RESEARCH QUESTION OR HYPOTHESIS:** Statin plus fibrate combination will provide more protection against major adverse cardiovascular events (MACE) than statin plus other non-statin therapy in high risk diabetic patients.

**STUDY DESIGN:** Incident new-user retrospective cohort study at the VA North Texas Healthcare System.

**METHODS:** Veterans 40-75 years of age with triglycerides > 200mg/dL and low HDL (males: <40mg/dL, females: <50mg/dL) with a type 2 diabetes diagnosis that were prescribed a statin and a non-statin cholesterol lowering drug between August 1, 2002 to August 1, 2005 were included. Patients were followed up to 10 years after initiation of non-statin. The primary outcome was comparison of time to first occurrence of MACE in those receiving a fibrate versus those receiving other non-statin therapy within 10 years of addition of the non-statin cholesterol medication to current statin therapy. Cox proportional hazards model was used in the time to event analysis controlled for sex and age. Patients were censored at date of competing risks or at end of study period if no MACE occurred.

**RESULTS:** The cohort included 552 patients, with an average age of 61 years. Most patients were male (96%) and received a moderate-intensity statin (87%). Risk of MACE outcomes was higher in those receiving statin plus other non-statin (n=134) compared to those receiving statin plus fibrates (n=418) (p-value = 0.034; HR 1.49; 95% CI: 1.03-2.16) over a 10 year period.

**CONCLUSION:** Combination statin with fibrate may help to reduce risk of cardiovascular events in high-risk diabetic patients more than other non-statin therapies.

**550. Dosing strategies of digoxin in acute decompensated heart failure requiring inotropic support** *Courtney A. Montepara, Pharm.D.*[1], Molly E. Wheeler, Pharm.D. Candidate[2], Simon W. Lam, Pharm.D., FCCM, BCPS, BCCCP[2], Kathleen D. Faulkenberg, Pharm.D., BCPS[2], J. Bradley Williams, Pharm.D., BCPS[2]; [1]Duquesne University School of Pharmacy, Pittsburgh, PA [2]Department of Pharmacy, Cleveland Clinic, Cleveland, OH

**INTRODUCTION:** Current guidelines recommend the use of digoxin, with other standard therapies, to reduce the symptoms associated with heart failure. Digoxin has a narrow therapeutic index, and the population that benefits from this therapy remains controversial. Furthermore, guidelines suggest there is no utility to loading digoxin in heart failure; however, this practice is still performed in patients with acute decompensated heart failure (ADHF) who require inotropic support. The impact of different dosing strategies of digoxin on the duration of concomitant intravenous inotropic therapy has not been assessed.

**RESEARCH QUESTION OR HYPOTHESIS:** In adult patients with ADHF, is the initiation of maintenance doses only of digoxin non-inferior to loading digoxin with regard to the duration of concurrent inotropic therapy?

**STUDY DESIGN:** Single-center, retrospective, non-inferiority cohort study

**METHODS:** Adult patients admitted to the heart failure ICU at Cleveland Clinic between 2008 and 2017 were included if they were newly initiated on digoxin while receiving intravenous inotropic therapy for

ADHF. Patients were divided into two cohorts: those who received maintenance doses alone and those who received loading doses initially. The primary outcome was the duration of intravenous inotropic therapy following digoxin initiation. A non-inferiority margin was set at 12 hours.

**RESULTS:** Loading doses of digoxin, with or without subsequent maintenance doses, were given to 91 (80%) patients, and maintenance doses only were given to 23 (20%) patients. The median difference in duration of intravenous inotropic therapy following digoxin initiation (no load – load) was 22.5 hours (90.7 hours vs. 68.2 hours; 95% CI -26.2 to 352 hours), which exceeded the prespecified non-inferiority margin.

**CONCLUSION:** The duration of concurrent inotropic therapy in subjects treated with maintenance digoxin dosing only was not non-inferior to subjects receiving loading digoxin doses when a 12-hour margin was employed for significance. The numerical difference observed may have clinical relevance. Future studies with larger sample sizes are needed to provide evidence for optimum digoxin dosing in the ADHF patient population.

## CRITICAL CARE

**551. The use of medication regimen complexity scoring tools to predict readmissions in transitions of care** *Anne Misher, Pharm.D., BCACP, BC-ADM, CDE*[1], Kaitlyn Ray, Pharm.D. Candidate 2019[2], Nelly Ayen, Pharm.D. Candidate 2019[3], Joseph Campanelli, BA, Pharm.D., BCPS[4], Joseph Crosby, Ph.D., R.Ph[5], Andrea Sikora Newsome, Pharm.D., BCPS, BCCCP[6]; [1]Department of Clinical and Administrative Pharmacy, University of Georgia College of Pharmacy, Savannah, GA [2]University of Georgia College of Pharmacy, Savannah, GA [3]South University School of Pharmacy, Savannah, GA [4]Internal Medicine – Candler Hospital, St. Joseph's/Candler Health System, Savannah, GA [5]Department of Health Sciences and Kinesiology, Georgia Southern University, Savannah, GA [6]Department of Pharmacy, UGA College of Pharmacy, Augusta, GA

**INTRODUCTION:** The Medication Regimen Complexity Index-ICU (MRC-ICU) correlates with intensive care unit (ICU) length of stay, mortality and patient acuity. A novel use of the MRC-ICU tool could be to predict 30-day readmissions; however, association has not been established between the MRC-ICU or SJCHS and hospital readmissions for patients discharged from ICU to outpatient setting. At St. Joseph's/Candler Health System an internal tool (SJCHS tool) assesses readmission risk; however, resources do not allow for pharmacists involvement with all patients. If association is established, the tool(s) may identify patients who benefit from pharmacy services.

**RESEARCH QUESTION OF HYPOTHESIS:** Is the MRC-ICU and/or SJCHS tool a predictor of 30-day readmissions?

**STUDY DESIGN:** Retrospective, observational analysis of ICU patients.

**METHODS:** Patients were included if at least 18 years old and discharged from the ICU between September and March 2018. Patients were excluded if expired while hospitalized or had incomplete data. Bivariate correlations of study variables included MRC-ICU score at admission, MRC-ICU score at discharge, SJCHS tool score and 30-day readmissions.

**RESULTS:** Within the study period, 124 of 248 patients met inclusion criteria and were analyzed. According to the SJCHS tool 26 patients were low risk, 36 were moderate risk and 62 were high risk for readmission. Correlation coefficients for 30-day readmission were 0.220, -0.057 and 0.036 for SJCHS tool, MRC-ICU at admission and MRC-CIU at discharge, respectively. Coefficients of determination ($r^2$) were 0.048, 0.003 and 0.0013 and for SJCHS tool, MRC-ICU at admission and MRC-CIU at discharge, respectively.

**CONCLUSION:** Results indicate the SJCHS score has weak association with readmission risk and explains only 4.8% of the variance associated with readmission in this patient population. The MRC-ICU score was not predictive of readmission risk, thus patients' medication regimen complexity and critical illness acuity during inpatient hospitalization may not be effective predictors of transition of care needs.

## EDUCATION/TRAINING

**552. Narrative case studies as an effective tool for developing empathy in pharmacy students** *Ryan Gibbard, Pharm.D.*[1], Charlie Bodreau, Pharm.D.[2], Amber Buhler, Ph.D.[1]; [1]School of Pharmacy, Pacific University Oregon, Hillsboro, OR [2]Department of Pharmacy, Providence Portland Medical Center, Portland, OR

**INTRODUCTION:** Although accreditation standards for pharmacy education exist regarding a graduate's ability to provide patient-centered care, there is limited research regarding effective ways to develop the attitudes and beliefs that form the foundation of that care such as the ability to effectively empathize with patients.

**RESEARCH QUESTION OR HYPOTHESIS:** Are narrative patient case studies an effective tool for developing empathy in pharmacy students?

**STUDY DESIGN:** Mixed-methods; across-method methodological triangulation

**METHODS:** Using a randomized, parallel group, cross-over design, students were asked to read two versions of a patient case (a traditional case and a narrative case) and respond to four statements: two assessing empathy and two assessing efficacy and ease of use of the case format. The order of cases was reversed in the second group. Their level of agreement with each statement was measured with a 5-point Likert scale. A final free-response question was included and the qualitative results were analyzed by a 3-reviewer team using thematic coding. Methodological triangulation for this across-method study was utilized to interpret the results.

**RESULTS:** 88 Students participated in this study. Students indicated a significantly greater ability to empathize with the patient after reading the narrative case compared to the clinical case (Group A $2.09 \pm 0.65$ vs. $2.72 \pm 1$; $p = 0.001$ and Group B $1.71 \pm 0.63$ vs. $2.33 \pm 0.64$; $p < 0.001$), regardless of case order. Themes that emerged from the qualitative analysis included greater efficiency with the traditional case but increased empathy and patient-centeredness with the narrative case.

Many students also expressed their desire to integrate both formats into their future practice.

**CONCLUSION:** A narrative case study appears to be an effective tool for developing empathy in pharmacy students and could potentially be useful in achieving the standards for pharmacy education.

**553. Assessing curricula in pharmacy education for degree of inclusion of topics related to combating the opioid epidemic** *Amanda Korenoski, Pharm.D., MHA*[1], Lauren Albert, Pharm.D. Candidate[2], Pamela L. Smithburger, Pharm.D., MS, BCCCP, FCCP[1]; [1]Department of Pharmacy and Therapeutics, University of Pittsburgh School of Pharmacy, Pittsburgh, PA [2]University of Pittsburgh School of Pharmacy, Pittsburgh, PA

**Introduction**: In 2016, 116 individuals died daily from opioid-related overdoses, an increase of 82% since 2012. Pharmacists have the capacity to intervene in the practice of opioid prescribing and/or dispensing. Prior to licensure, only one state requires education within the Pharm.D. program specific to combating opioid misuse and abuse, and there is no accreditation standard for curricula.

**RESEARCH QUESTION OR HYPOTHESIS:** What are the current practices surrounding opioid education and addiction in U.S. Schools of Pharmacy (SOP) and have the practices changed considering the opioid epidemic?

**STUDY DESIGN:** Web-based cross-sectional survey.

**METHODS:** A 26-item, anonymous survey regarding pain management, addiction, and opioid dispensing was distributed to one faculty member at each SOP with expertise in the SOP curricula/toxicology. Questions consisted of multiple choice, text, and numerical responses to describe current practices in the curriculum and changes made within 5 years. Data were analyzed using descriptive statistics.

**RESULTS:** Surveys were completed by 32/137 SOP. Three SOP stated addiction and/or opioid dispensing were not specifically addressed. In PY2, 16 schools discussed pain management; 13 addiction; 7 opioid dispensing, either individually or in combination. Time spent on the topics has not changed in almost half (47%) of SOP. On average, total required coursework (hours) was: 11.9 for pain management, 6.2 for addiction, and 6.3 for opioid dispensing. The most commonly identified barriers to developing additional education are time (67%) and faculty resources (11%).

**CONCLUSION:** Based on this small sample of SOP, the topics of pain management, addiction, and opioid dispensing have not increased in response to the opioid epidemic. The low response rate may be due to a lack of focus in the area. Considerations should be made by SOP to identify topics surrounding opioid use/abuse and addiction missing from the curriculum and address implementation barriers, arming graduates to best care for patients who may have a substance use disorder.

**554. Mock compounded sterile preparation review at the experiential site** *Toral Patel, Pharm.D.*[1], Amy Go, Pharm.D.[2], Ganesh Chandran, Pharm.D.[2], Heather Anderson, Ph.D.[3]; [1]Department of Clinical Pharmacy, University of Colorado, Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO [2]Inpatient Pharmacy, University of Colorado Hospital, Aurora, CO [3]Department of Clinical Pharmacy, University of Colorado Denver Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

**INTRODUCTION:** Reviewing compounded sterile preparations (CSPs) is an entry-level pharmacist responsibility in hospitals. New graduates often express anxiety to assume this responsibility. Pharmacy students receive varying education about compounding within didactic curricula. The process from preparation to final CSP review isn't often actualized by students until experiential rotations or beyond and hospitals are challenged to offer opportunities preparing actual CSPs during rotations.

**RESEARCH QUESTION OR HYPOTHESIS:** Practice reviewing CSPs during rotations will increase student confidence.

**STUDY DESIGN:** Pre-/post-education comparison of student confidence in reviewing CSPs

**METHODS:** APPE students at University of Colorado Hospital (UCH) were offered an educational activity reviewing CSPs. Students were asked to complete an online pre-activity survey to examine confidence in the following areas using a Likert scale (Very confident, somewhat confident, somewhat unconfident, and very unconfident): reviewing CSPs; identifying necessary missing information; determining stability, determining concentration, and determining diluent. The same survey was provided to students post-activity. Pre-/post-survey questions were compared using Wilcoxon Sign Rank test to assess change in student confidence. Statistical significance was set at p-value <0.05.

**RESULTS:** Thirty-five students completed the activity March to August 2018. Twenty students completed the educational activity and the pre-/post-surveys. Student confidence increased in all 5 areas: reviewing CSPs, identifying necessary missing information, determining stability, determining concentration, and determining diluent, (mean increases of 0.9 (p=0.002), 0.95 (p=0.001), 0.45 (p=0.0156), 0.6 (p=0.0020), and 0.9 (p=0.005), respectively). Self-confidence in 10 students with prior sterile compounding work experience did not increase significantly in any of the 5 areas when analyzed independently.

**CONCLUSION:** Incorporating practice to review CSPs during experiential rotations increased student self-confidence to perform this entry-level responsibility in students that did not have prior work experience preparing CSPs.

## SYSTEMATIC REVIEWS/META-ANALYSIS

## ADR/DRUG INTERACTIONS

**555. Management of dipeptidyl peptidase-4 inhibitor-associated angioedema in type 2 diabetes patients: a systematic review** Raghda Elsayed, Pharm.D. and *Anthony Walker, Pharm.D.*; Clinical Sciences, University of Louisiana at Monroe, Monroe, LA

**BACKGROUND:** Dipeptidyl-peptidase-4 inhibitors (DPP4-Is) are appealing for most T2D patients seeking oral options due to negligible hypoglycemia and minimal side effects. Since most T2D patients take an angiotensin converting enzyme inhibitor (ACEi) or angiotensin receptor blocker (ARB), an increased risk of drug-induced bradykinin angioedema is anticipated particularly with the combination of two inhibitors of bradykinin catabolism (ACEi or ARB plus DPP4-I). This study aims to investigate angioedema management practices associated with symptom resolution in this patient population.

**METHODS:** A systematic PubMed database search was performed using the keywords sitagliptin, saxagliptin, linagliptin, alogliptin, dipeptidyl*, or DPP*, coupled to adverse event-related term "angioedema" using the Boolean operator (AND). English language publications involving T2D patients were included. Furthermore, review articles, animal studies, and reports of non-FDA approved DPP4-Is were excluded. Findings are reported using descriptive statistics.

**RESULTS:** Seven case reports of DPP4-I associated angioedema in T2D patients were selected for inclusion. Patients used an ACEi or ARB in 86% of the reported incidents. No improvement of symptoms was observed when steroids, antihistamines, or epinephrine were administered in four (80%) of the patients who presented to the emergency department. Resolution of symptoms was observed with C1 esterase-inhibitor, bradykinin inhibitor (icatibant), tranexamic acid, prothrombin complex concentrate, or a combination of these therapeutic options. Furthermore, withholding only the ACEi (not the DPP4-I) was associated with recurrent or worsening of angioedema, leading to nearly therapy resistant angioedema and intubation in one case.

**DISCUSSION:** To our knowledge, this is the first systematic review to study the management practices of DDP4-I associated angioedema in T2D patients. Discerning conclusions on the effectiveness of utilizing specific medications for DPP4-I associated angioedema is difficult at this time due to the limited number of studies; thus, further investigations are needed.

**OTHER:** Authors report no conflicts or funding support. Application for PROSPERO registration was submitted (ID 100193).

## CARDIOVASCULAR

**556E. Effect of ezetimibe added to high-intensity statin therapy in patients with hypercholesterolemia: a meta-analysis** Hua Ling, Pharm.D., BCPS, *Jiehyun Lee*, *Pharm.D.*, *BCACP*, *CACP*, Michael Cooley, Pharmacy Student, Ricky Ayoung-Chee, Pharmacy Student and James Hernandez, Pharmacy Student; School of Pharmacy, Philadelphia College of Osteopathic Medicine, Suwanee, GA

Presented at American Heart Association QCOR 2018 Scientific Sessions, Arlington, VA, April 6-7, 2018.

**557. Effect of high dose ranolazine on hemoglobin a1c levels in patients with diabetes mellitus: a systematic review** Hua Ling, Pharm. D., BCPS[1], *David Ombengi*, *Pharm.D.*, *MBA*, *MPH*[2], Thuymy Nguyen, Pharmacy Student[1]; [1]School of Pharmacy, Philadelphia College of Osteopathic Medicine, Suwanee, GA [2]Department of Clinical Sciences, Medical College of Wisconsin School of Pharmacy, Milwaukee, WI

BACKGROUND: The antihyperglycemic effect of the antianginal drug ranolazine has been recently reported. The objective of this systematic review is to summarize the evidence from published literature detailing the impact of high dose ranolazine (1000 mg twice daily) on hemoglobin A1c (HbA1c) levels in patients with diabetes mellitus (DM).

**METHODS:** A systematic literature search was performed through Feb 2018 using PubMed, EMBASE and Cochrane databases with the following key terms: "'ranolazine'", "glucose", "diabetes", "A1c", and "glycemic". The review was restricted to randomized controlled trials published in English in diabetic patients with HbA1c changes reported as study endpoints. Studies using low dose ranolazine (500 mg twice daily) were excluded. The Cochrane Risk of Bias Tool was used to assess bias risk.

**RESULTS:** Of the initial 180 citations, seven randomized controlled trials involving 3,437 patients were included in this review. A meta-analysis of four of the seven trials was conducted, showing adding ranolazine to the standard antidiabetic therapy significantly reduced HbA1c levels by 0.47% (95% CI -0.57% to -0.36%, P < 0.00001) compared to placebo (heterogeneity: P = 0.56; $I^2$ = 0%). Similar results were reported in another study, where ranolazine as monotherapy in patients with uncontrolled DM managed by lifestyle alone reduced HbA1c levels by 0.56% (95% CI -0.76% to -0.36%, p < 0.0001). Two other studies investigated the relationship between effect of ranolazine and baseline HbA1c, and greater reduction of HbA1c was observed in patients with poorer glycemic control. These results were consistent with the CARISA trial as higher HbA1c reduction was noted in patients taking insulin. Discussion: High dose ranolazine has been shown to have positive antihyperglycemic effects in patients with DM. Ranolazine as adjunct therapy for severe chronic angina may provide additional benefits in patients with comorbid DM and chronic stable angina. Other: Authors have no disclosures.

## CRITICAL CARE

**558. Midodrine in patients with resolving shock: systematic review and meta-analysis** *Melanie Smith*, *Pharm.D.*, *BCPS*[1], Gary Peksa, Pharm.D.[2], Bryan Menich, Pharm.D.[3], Jasshan Mehrotra, MD[4], Robert Balk, MD[4], Drayton Hammond, Pharm.D., MBA, BCPS, BCCCP[3]; [1]Department of Pharmacy, Medical University of South Carolina, Charleston, SC [2]Departments of Pharmacy and Emergency Medicine, Rush University Medical Center, Chicago, IL [3]Department of Pharmacy, Rush University Medical Center, Chicago, IL [4]Department of Pulmonary Critical Care, Rush University Medical Center, Chicago, IL

**BACKGROUND:** Midodrine may assist with transitioning patients with resolving shock from intravenous (IV) vasopressors and facilitate intensive care unit (ICU) transfer. This systematic review and meta-analysis describes the effectiveness of midodrine in adults with

resolving shock. Outcomes evaluated were ICU and hospital length of stay (LOS), duration of IV vasopressors, mortality, and adverse events in patients receiving midodrine versus usual care.

**METHODS:** Medline, Embase, and Scopus were searched through April 2018 for English language controlled trials and observational studies using "midodrine" AND "liberation, weaning, hypotension" in adults. Continuous variables used inverse-variance method to measure mean difference. Dichotomous variables used the Mantel-Haenszel method to measure odds ratio (OR). Heterogeneity was assessed using $I^2$ statistics. Pooled data were analyzed with a random-effects model. Risk of bias was assessed using National Heart, Lung, and Blood Institute tools.

**RESULTS:** Five studies totaling 3672 medical and surgical ICU patients were included. There was no difference between non-midodrine and midodrine groups for ICU (1.38 days, 95% CI -3.48 to 6.23, $I^2$=93%) and hospital LOS (4.37 days, 95%CI -3.45 to 12.19, $I^2$=93%) in three studies. Mortality was similar between groups (25% vs. 22%; OR 0.74, 95% CI 0.44 to 1.27, $I^2$=65%). In two studies, patients receiving midodrine had longer, non-significant, vasopressor durations (7.28 days, 95% CI, -0.86 to 15.41, $I^2$=97%). Bradycardia was the most common adverse event, occurring in 1.4% of midodrine patients. Three studies were good quality and two were fair.

**DISCUSSION:** Although midodrine has been used to facilitate liberation of patients from IV vasopressors, this meta-analysis found that patients exposed to midodrine had longer, non-significant, vasopressor durations. Only observational studies were available, and significant heterogeneity existed. Further studies are needed to define midodrine's benefit, if any, in vasopressor titration.

**OTHER:** The trial was registered (PROSPERO CRD42018092880). There are no conflicts of interest and no funding.

## EMERGENCY MEDICINE

**559. Glucagon for the treatment of acute esophageal foreign body and food impaction: a systematic review and meta-analysis** Gary Peksa, Pharm.D.[1], Joshua DeMott, Pharm.D., MSc[2], *Giles Slocum, Pharm.D.*[2], Jaxson Burkins, Pharm.D.[2], Michael Gottlieb, MD[3]; [1]Departments of Pharmacy and Emergency Medicine, Rush University Medical Center, Chicago, IL [2]Department of Pharmacy, Rush University Medical Center, Chicago, IL [3]Department of Emergency Medicine, Rush University Medical Center, Chicago, IL

**BACKGROUND:** Glucagon is frequently trialed for the relief of esophageal impactions. This systematic review and meta-analysis was performed to evaluate the efficacy and safety of glucagon for acute esophageal foreign body and food impactions. The primary outcome was treatment success. Secondary outcomes included rates of adverse events and vomiting.

**METHODS:** PubMed, CINAHL, LILACS, Scopus, Cochrane Database of Systematic Reviews, and Cochrane Central Register of Controlled Trials were searched from inception to March 1, 2018 without language or age restrictions. Retrospective, observational, and randomized controlled trials assessing glucagon for the relief of acute esophageal foreign body and food impaction were included. Studies must have had a comparator (eg, control or placebo). Quality analysis was performed using the Cochrane Risk of Bias tool.

**RESULTS:** Five studies (n=1,185 patients) were identified. Treatment success occurred in 213 of 706 (30.2%) patients in the glucagon group and 158 of 479 (33.0%) patients in the control group (odds ratio (OR) 0.90; 95% CI 0.69 to 1.17). Adverse events were identified in 24 of 160 (15.0%) patients in the glucagon group and 0 of 53 patients in the placebo group (OR 8.86; 95% CI 1.50 to 52.38). Vomiting events occurred more frequently in the glucagon group (10.6% vs. 0%; OR 5.81; 95% CI 0.70 to 48.49). All studies were at overall low risk of bias.

**DISCUSSION:** Glucagon was not associated with a difference in treatment success, but had a higher rate of adverse events. This study does not support the use of glucagon for the treatment of esophageal foreign body and food impaction.

**OTHER:** This protocol was registered with PROSPERO (CRD42017082302). No funding was received, and authors declare no conflicts of interest.

## GERIATRICS

**560. Use of melatonin and melatonin receptor agonists for the treatment of insomnia in older adults: a systematic review and meta-analysis** *Srujitha Marupuru, Pharm.D.*, Mira Patel, MS, Ashley Campbell, Pharm.D., BCPS, Jeannie K Lee, Pharm.D., BCPS, BCGP, FASHP; Department of Pharmacy Practice and Science, University of Arizona, Tucson, AZ

**BACKGROUND:** Insomnia is a prevalent sleep condition that affects older adults at a high rate. Melatonin is a common treatment that is used to treat this condition in a general population. The purpose of this study was to investigate the efficacy of melatonin and melatonin receptor agonists (MRAs), compared to placebo, among studies reporting sleep outcomes in older adults with chronic insomnia.

**METHODS:** A comprehensive search was conducted in nine databases (including PubMed, Embase, and PsycINFO) using a combination of keywords, such as "insomnia", "melatonin", "sleep quality", and "sleep duration". The timeframe of the search was from January 1, 1990 to March 17, 2018. Studies published in the English language that reported sleep outcomes for individuals aged 50 years and older who were taking melatonin or MRAs were included. Primary outcomes included sleep latency, sleep efficiency, sleep quality. Two reviewers independently screened for study eligibility and data extraction and met for consensus on inclusion of studies. Included studies were evaluated using a Cochrane risk of bias assessment. Heterogeneity was assessed and a random effect model was used for the meta-analysis.

**RESULTS:** Seventeen studies were included in the systematic review, and of those, 14 had sufficient data to be included in the meta-analysis. Melatonin/MRAs demonstrated significant efficacy in reducing sleep latency (weighted mean difference (WMD) = 14.4 minutes [95% CI 6.2- 22.6], Z = 3.45, p= 0.001) and increasing sleep efficiency (WMD = 4.7% [95% CI 1.6-7.7], Z = 3.0, p = 0.001). Trials using lower

doses and longer duration demonstrated increased effects on sleep efficiency. Sleep quality was significantly improved in subjects taking the treatments compared to placebo.

**DISCUSSION:** Melatonin and MRAs showed positive sleep outcomes among older adults with chronic insomnia and improvements were seen with lower dose and prolonged use.

**OTHER:** Source of funding: None

Conflict of interest: None

Registration number: None

## HEMATOLOGY/ANTICOAGULATION

**561. A systematic review of real-world data evaluating adherence with factor Xa inhibitors compared to other oral anticoagulants in non-valvular atrial fibrillation** *Jaini Patel, Pharm.D., BCACP*[1], Regina Arellano, Pharm.D., BCPS[2]; [1]Pharmacy Practice, Midwestern University Chicago College of Pharmacy, Downers Grove, IL [2]Department of Pharmacy Practice, Midwestern University Chicago College of Pharmacy, Downers Grove, IL

**BACKGROUND:** Non-adherence to oral anticoagulant (OAC) therapy for non-valvular atrial fibrillation (NVAF) increases risk of stroke. Use of factor Xa inhibitors (Xabans) for NVAF is rising and thus it is important to evaluate if Xabans provide an advantage of improved adherence. This review summarizes comparative, real-world adherence literature with Xabans and other OACs.

**METHODS:** A literature search using Pubmed, Medline, CINAHL and other databases was completed for peer reviewed, English journals published between April 01, 2016 and May 01, 2018 using terms “adherence”, “persistence”, “discontinuation”, “non-adherence” in combination with “rivaroxaban”, “apixaban”, “edoxaban”, “oral anticoagulants”, “warfarin”, “dabigatran”, and “atrial fibrillation”. Inclusion criteria was: (1) OAC was prescribed for NVAF and (2) real-world adherence, persistence, or discontinuation rates were evaluated in a comparative fashion including at least one of the Xaban agents. Both investigators repeated the search process to minimize selection bias.

**RESULTS:** This review comprises of 24 studies, including retrospective (n=22), prospective (n=1), and observational (n=1) trials, conducted in USA (n=11), UK (n=1), France(n=2), Germany (n=2), Spain (n=2), Italy (n=2), Denmark (1), Australia (n=1), Sweden (n=1), and Canada (n=1). The retrospective trials used pharmacy refill records, insurance claims, or medical records and measured adherence via medication possession ratio and proportion of days covered. Studies compared adherence of rivaroxaban (n=24), apixaban (n=17), dabigatran (n=22), and Warfarin (n=11). Overall, Xabans had higher adherence rates compared to warfarin and dabigatran.

**DISCUSSION:** Based on this review, Xabans provide advantage of improved adherence compared to other OACs when selecting them for NVAF management. Although it is a limitation that study results from other countries can't be extrapolated to the US population due to several variables, it also provides external validity to findings of this review. To facilitate selection of one Xaban over another, more head-to-head real-world data comparing their adherence rates is warranted.

**OTHER:** Funding: none. Conflicts of interest: none

**562. Systematic literature review and network meta-analysis of betrixaban for venous thromboembolism prophylaxis** Vicki Laskier, MMath[1], Holly Guy, MSc[1], Mark Fisher, MSc[1], W Richey Neuman, MD, MPH[2], *Iwona Bucior, Ph.D.*[2], Alexander T Cohen, MBBS, MSc, MD, FRACP[3], Shijie Ren, Ph.D.[4]; [1]FIECON Ltd, St Albans, United Kingdom [2]Portola Pharmaceuticals, Inc., South San Francisco, CA [3]Guy's and St Thomas' NHS Foundation Trust, London, United Kingdom [4]The University Of Sheffield, Sheffield, United Kingdom

**BACKGROUND:** The risk of venous thromboembolism (VTE) continues post-discharge in hospitalized, nonsurgical acute medically ill patients. The objective was to determine the relative clinical effectiveness and safety of extended-duration betrixaban compared to standard-duration alternative anticoagulants for VTE prophylaxis.

**METHODS:** A systematic literature review was conducted in EMBASE, Medline, and Cochrane until December 2017 to identify randomized controlled trials (RCTs) of VTE prophylaxis in hospitalized, nonsurgical acute medically ill patients at risk of VTE. Studies reporting VTE events (including death) and major bleeding from prophylaxis initiation to 20-50 days thereafter were retrieved and extracted. Bias and heterogeneity were assessed using Pharmaceutical Benefits Advisory Committee guidelines. A Bayesian fixed effect network meta-analysis was used to estimate the comparative efficacy and safety.

**RESULTS:** In the seven RCTs included, betrixaban, low molecular weight heparins (LMWHs), unfractionated heparin (UFH), fondaparinux sodium (FS), and placebo were compared. The odds of VTE were significantly higher with standard-duration LMWHs (median odds ratio [95% credible interval]) (1.4 [1.1-1.7]), UFH (1.6 [1.0-2.5]) and placebo (2.4 [1.5-3.7]) compared to betrixaban. There were significantly higher odds of VTE-related death with placebo (7.8 [2.1-34.4]) compared to betrixaban. There were numerically higher odds of VTE with FS and VTE-related death with LMWH and FS compared to betrixaban although non-significant. The odds of major bleeding were not significantly different with betrixaban relative to any standard-duration VTE prophylaxis.

**DISCUSSION:** In this analysis, extended-duration VTE prophylaxis with betrixaban was shown to be an effective regimen, with evidence of a positive net-clinical-benefit that could contribute to reducing the persistent burden of VTE in high-risk hospitalized, nonsurgical patients with acute medical illness who need extended-duration VTE prophylaxis.

**OTHER:** FIECON Ltd. were commissioned by Portola Pharmaceuticals Inc. to perform this analysis.

## HERBAL/COMPLEMENTARY MEDICINE

**563. Systematic review of barriers to integrating complementary health approaches with conventional care in the united states** *Timothy Hutcherson, Pharm.D.*[1], Nicole Cieri-Hutcherson, Pharm.D., BCPS[2], Ashley Gluszek, BS, Pharm.D. Candidate[1], Wei Xin Li, Pharm.D.

Candidate[1], Mudit Singhal, Ph.D.[1]; [1]School of Pharmacy, D'Youville College, Buffalo, NY [2]University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY

**BACKGROUND:** Approximately 40% of Americans utilize complementary health approaches (CHA); although, conventional care (CC) practitioners may be reluctant to recommend CHA. This systematic review characterizes perceived barriers to integrating CHA with CC as reported by United States (US) CC practitioners.

**METHODS:** A systematic search of Medline through Ovid, Embase, and International Pharmaceutical Abstracts was performed in June 2018 seeking primary literature of CC practitioners' perceptions of CHA. Keywords (and synonyms or permutations thereof) included CHA; conventional medicine and associated practitioners; integration; and opinions. The search was limited to humans and English language; duplicates were removed prior to screening. Manual bibliographic reviews were conducted to verify rigor of the search. A screening tool identified articles meeting predefined inclusion criteria (US-based CC practitioners reporting barriers to CHA integration); all other articles were excluded. All articles were screened and data extracted by at least two investigators. A multi-point risk-of-bias analysis was applied to all included studies.

**RESULTS:** The search yielded 729 resultant articles; 13 studies (n=2763 respondents) met the inclusion criteria. Studies were cross-sectional surveys or semi-structured interviews spanning 1999-2017. Respondents included 2055 physicians, medical residents, or students; 379 nurses; 31 pharmacists; and 282 other clinicians. Barriers to integrating CHA into CC practices included limited CHA training (13 studies; 100%); limited evidence supporting CHA (11; 84.6%); provider-patient communication (11; 84.6%); limited time to practice CHA (7; 53.8%); providers' beliefs about CHA (7; 53.8%); lack of institutional infrastructure (5; 38.5%); lack of third-party reimbursement (5; 38.5%); cost-effectiveness (4; 30.8%); liability (4; 30.8%); and interprofessional communication (2; 15.4%).

**DISCUSSION:** As several barriers for CHA integration exist per CC practitioners, development of strategies for addressing these are necessary. Although comprehensive and systematic in nature, inclusion of only US practitioners may limit generalizability of this review.

**OTHER:** Authors have no conflicts of interest to disclose. The study was neither funded nor registered.

## INFECTIOUS DISEASES

**564. Glecaprevir/pibrentasvir for the treatment of hepatitis C: a systematic review** *Elias Chahine, Pharm.D., FCCP, BCPS (AQ-ID)*, Thica Tran, Pharm.D. Candidate, Rita Chamoun, BS, Pharm.D. Candidate and AnneMarie Blake, Pharm.D. Candidate; Lloyd L. Gregory School of Pharmacy, Palm Beach Atlantic University, West Palm Beach, FL

**BACKGROUND:** Direct-acting antivirals (DAAs) represent a breakthrough in the treatment of hepatitis C virus (HCV) infection. The objective of this report is to review the efficacy of glecaprevir/pibrentasvir in patients with HCV infection.

**METHODS:** A literature search was conducted through November 2017 utilizing Medline with the following search terms "glecaprevir", "pibrentasvir", "ABT-493", and "ABT-530". Additionally, relevant abstracts from The Liver Meeting were also reviewed. The risk of bias was assessed using the Cochrane Risk of Bias Tool.

**RESULTS:** Six Phase I, six Phase II, and twelve Phase III trials were retrieved. Primary endpoints were sustained virologic response (SVR) rates 12 weeks after the end of treatment. ENDURANCE-1 enrolled 703 treatment-naïve or treatment-experienced patients with HCV genotype 1 without cirrhosis. Non-inferiority was demonstrated between the 8-week and 12-week arms based on SVR rates of 99.1% (95% CI 98.1-100) and 99.7% (95% CI 98.1-100), respectively. ENDURANCE-2 enrolled 303 treatment-naïve or treatment-experienced patients with HCV genotype 2 without cirrhosis. Twelve-week glecaprevir/pibrentasvir yielded an SVR rate of 99% (95% CI 98.5-100). ENDURANCE-3 enrolled 505 treatment-naïve patients with HCV genotype 3 without cirrhosis. SVR rates were 95% (95% CI 92-98) in the 8-week glecaprevir/pibrentasvir arm, 95% (95% CI 93-98) in the 12-week glecaprevir/pibrentasvir arm, and 97% (95% CI 91-99) in the 12-week sofosbuvir/daclatasvir arm. Non-inferiority was demonstrated between the 8-week and 12-week glecaprevir/pibrentasvir arms, and between the 12-week glecaprevir/pibrentasvir arm and the sofosbubir/daclatasvir arm. EXPEDITION-1 enrolled 146 treatment-naïve or treatment-experienced patients with HCV genotypes 1, 2, 4, 5, or 6 and compensated cirrhosis to receive glecaprevir/pibrentasvir for 12 weeks. The SVR rate was 99% (95% CI 98-100). Glecaprevir/pibrentasvir was well tolerated.

**DISCUSSION:** Glecaprevir/pibrentasvir represents a pangenotypic fixed-dose regimen for the treatment of HCV infection with high SVR rates in treatment-naïve and treatment-experienced patients with or without compensated cirrhosis. The duration of therapy ranges from 8 to 16 weeks.

**OTHER:** N/A

**565. Clinical failure with 3-day course of azithromycin versus long course of other macrolides in adults with community-acquired pneumonia: a systematic review and meta-analysis** Khalid Eljaaly, Pharm. D., MS, BCPS[1], *Samah Alshehri, Pharm.D., MS, BCPS*[2]; [1]University of Arizona, tucson, AZ [2]Clinical Pharmacy Department, King Abdulaziz University, Jeddah, Saudi Arabia

**BACKGROUND:** Azithromycin for 5 days is recommended for treatment of community-acquired pneumonia (CAP), while longer courses of other macrolides are options too. Some clinicians are concerned about possibility of worse outcomes with shorter duration of therapy. The aim of this study is to compare clinical failure of CAP in adults treated with 3-day course of azithromycin versus long course of other macrolides.

**METHODS:** Two investigators independently searched the PubMed, EMBASE and Cochrane Library databases through Feb 15, 2018. Any randomized-controlled trials (RCT) comparing clinical failure of therapy with 3-day azithromycin course versus longer course (>7 days) of other macrolides in adults with CAP were included. Studies missing one of these criteria were excluded. We estimated absolute risk differences with 95% confidence intervals (CIs) using random-effects

model and evaluated heterogeneity ($I^2$). Risk of bias was assessed by Cochrane risk of bias tool for RCTs.

**RESULTS:** Five RCTs (total of 626 patients) were included. Four studies used 10 days of other macrolides and clarithromycin, while one study used 14 days of other macrolides and roxithromycin. Three studies included both inpatients and outpatients, one included inpatients, and one included outpatients. A significantly lower clinical failure was found with 3-day course of azithromycin compared to long-course of other macrolides (RD, -0.065; 95% CI, -0.128 to -0.002; P-value=0.043; $I^2$=0%).

**DISCUSSION:** The main strength of this meta-analysis is including RCTs, minimizing the risk of bias and confounding factors. On the other hand, the main limitation probably is including both inpatients and outpatients; however, this was decided because of risk of not including enough studies to have adequately powered meta-analysis. For the first time, it was shown that 3-day course of azithromycin was associated with lower clinical failure versus long course of other macrolides in adults with CAP.

**OTHER:** No funding, conflict of interest, or registration are applicable for this study.

**566. Systematic review of antimicrobial stewardship in long-term care facilities: an opportunity for intervention** *Kristy Shaeer, Pharm.D., MPH*[1], Jonathan Cho, Pharm.D., BCPS[2], Monika Zmarlicka, Pharm.D.[3], Marylee Worley, Pharm.D.[4], Joseph Hong, Pharm.D.[5], Lauren Tesh, Pharm.D.[6]; [1]Department of Pharmacotherapeutics and Clinical Research, University of South Florida College of Pharmacy, Tampa, FL [2]College of Pharmacy, The University of Texas at Tyler, Tyler, TX [3]Department of Pharmacy, Maricopa Medical Center, Phoenix, AZ [4]Pharmacy Practice, Nova Southeastern University College of Pharmacy, Fort Lauderdale, FL [5]Bay Pines Veteran Affairs Heathcare System, St Petersburg, FL [6]Food and Drug Administration, Silver Springs, MD

**BACKGROUND:** Antimicrobial stewardship programs (ASPs) in long-term care facilities (LTCFs) are needed to prevent development of resistance and adverse effects associated with inappropriate use. LTCFs serve as reservoirs for transmission of multidrug resistant organisms (MDROs). The Centers of Medicare and Medicaid Services released a ruling mandating implementation of infection control measures in LTCFs, including ASPs, to minimize MDROs transmission. This study was conducted to provide a systematic review of successful practices in LTCFs.

**METHODS:** PubMed, EBSCO, and EMBASE databases were searched until August 12, 2017 for publications in English describing interventions and outcomes of ASPs in LTCFs. Search terms included: "nursing home," "antimicrobial stewardship," "long-term care facilities," "antibiotic use," and "resistance". Included articles quantitatively assessed the impact of an intervention designed to improve antimicrobial use or surveyed current practices in a LTCF, nursing home, or skilled nursing facility.

**RESULTS:** Twenty-three studies met inclusion and varied in study designs from mail-in questionnaires to randomized control trials. Eighteen studies described interventions to impact prescribing practices and five surveyed providers to determine current practices. Five of the 23 studies assessed the impact of prescribing for urinary tract infections and three for pneumonia. Interventions relied heavily on provider education with involvement of a multidisciplinary team. Many studies demonstrated positive impact and receptiveness towards implementation of ASPs.

**DISCUSSION:** Available data describing ASPs in LTCFs is variable and difficult to make direct comparisons. More research is needed to establish best practices for LTCFs. ASPs are crucial in order to protect the health of residents, staff and healthcare providers in LTCFs and this in turn will protect the health of the public by decreasing the development of MDROs while optimizing antimicrobial use.

**OTHER:** Selection bias was minimized by clearly defining inclusion criteria. Long-term acute care hospitals were excluded due to the vast differences in practice settings and resources.

**567. Systematic review of the clinical utility of methicillin-resistant staphylococcus aureus (mrsa) nasal screening for mrsa pneumonia** *Melanie Smith, Pharm.D., BCPS*[1], Amy Brotherton, Pharm.D.[2], Katherine Lusardi, Pharm.D.[3], Carrie Tan, Pharm.D.[4], Drayton Hammond, Pharm.D., MBA, BCPS, BCCCP[4]; [1]Department of Pharmacy, Medical University of South Carolina, Charleston, SC [2]Department of Pharmacy, The Miriam Hospital, Providence, RI [3]University of Arkansas for Medical Sciences, Little Rock, AR [4]Department of Pharmacy, Rush University Medical Center, Chicago, IL

**BACKGROUND:** Methicillin-resistant *Staphylococcus aureus* (MRSA) nasal screening is frequently used for infection control purposes but use in antimicrobial stewardship programs (ASP) is increasing. The objective of this systematic review is to describe the diagnostic performance of MRSA nasal screening in pneumonia. Outcomes describe the utility of MRSA nasal screening including negative predictive value (NPV).

**METHODS:** Medline and Scopus were searched through February 2018 for English language controlled trials and observational studies using "MRSA" and "screening, surveillance, nares, nasal, pneumonia" in adults. Studies measuring correlation of MRSA nasal screening and clinical culture for pneumonia were included. Risk of bias was assessed using National Heart, Lung, and Blood Institute tools.

**RESULTS:** Twenty studies, including 21,881 patients, were included. Fifteen were in the critically ill, 3 in the acutely ill, and 2 did not specify. Nasal screening for MRSA had a high NPV (up to 99.4%) across all types of pneumonia. No screening site (nares or throat/trachea) was superior (NPV 97% vs. 99%). Four studies reported use of this test for ASP. Time from screening to culture varied (2 to 21 days). Based on these studies, a cut-off of 7 days seems most appropriate for ASP use. Studies found that implementation of a stewardship initiative including this test led to a 2.1 day reduction in vancomycin ($p<0.001$) and a cost avoidance of $21,031 over two years. Six studies were good quality, 9 fair, and 5 poor.

**DISCUSSION:** MRSA nasal screening has a high NPV for MRSA involvement in pneumonia. Utilizing this test for ASP can provide a tool for reducing antibiotics and provide additional cost benefits. Only

observational studies were available, and significant heterogeneity existed. Further prospective studies are needed to define ASP use of this test and potential clinical and cost implications.

**OTHER:** The trial was registered (PROSPERO CRD42017079477). There are no conflicts of interest or funding.

**568. A systematic review on the impact of antifungal stewardship interventions in the united states** *Emily Hart, Pharm.D. Student*, Melanie Nguyen, Pharm.D. Student, David M. Jacobs, Pharm.D., Ph.D.; Department of Pharmacy Practice, University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY

**BACKGROUND:** Antimicrobial resistance is a widely recognized public health threat, and stewardship interventions to combat this problem have been well described. Less is known about antifungal stewardship (AFS) initiatives and the influence of these programs within the United States. The purpose of this study was to evaluate evidence on the impact of AFS interventions on clinical and performance measures.

**METHODS:** A systematic review of English language studies using PubMed and EMBASE was performed through November 2017. The review was conducted in accordance with PRISMA. Search terms included antifungal stewardship, antimicrobial stewardship, Candida, candidemia, candiduria, and invasive fungal disease. Eligible studies were those that described an AFS program or intervention occurring in the U.S. and evaluated clinical or performance measures.

**RESULTS:** 54 articles were identified and 13 were included. Five studies evaluated AFS interventions and reported clinical outcomes (mortality and length of stay) and stewardship measures (appropriate antifungal choice and time to therapy). The remaining eight studies evaluated general stewardship interventions and reported data on antifungal consumption. All studies were single center, quasi-experimental with varying interventions across studies. AFS programs had no impact on mortality (3 of 3 studies), with a rate of 27% in the intervention group and 23% in the non-intervention group. Length of stay (5 of 5) was also similar between groups (range, 9-25 vs 11-22). Time to antifungal therapy improved in 2 of 5 studies, and appropriate choice of antifungal increased in 2 of 2 studies. Antifungal consumption was significantly blunted or reduced following stewardship initiation (8 of 8), although a direct comparison between studies was not possible due to a lack of common units.

**DISCUSSION:** Available evidence suggests that AFS interventions can improve stewardship measures and decrease antifungal consumption. Although this review did not detect improvements in clinical outcomes, significant adverse outcomes were not reported.

**OTHER:** No funding, conflicts, or registration.

## NEUROLOGY

**569. The effect of antiretroviral therapy with high central nervous system penetration on HIV-related cognitive impairment: a systematic review and meta-analysis** *Andrew Webb, Pharm.D. Candidate* and Ashley Buchanan, DrPH, MS; College of Pharmacy, University of Rhode Island, Kingston, RI

**BACKGROUND:** Chronic complications are a concern for patients living with HIV infection. HIV-associated neurocognitive disease (HAND) is prevalent among patients with HIV. Medications that penetrate the central nervous system (CNS) may be effective at slowing HAND progression. This study aims to evaluate if higher CNS penetration effectiveness (CPE) regimens, defined as CPE ≥7, delays neurocognitive decline in adult patients with HIV.

**METHODS:** Using PubMed and EMBASE (from inception to November 2017), primary literature evaluating cognitive outcomes based on CPE score of cART regimens was assembled. Two aggregate scores were utilized as outcomes: NPZ-4, an aggregate of four common neurocognitive tests, and global deficit score (GDS), an aggregate of twelve common neurocognitive tests. Results were combined using fixed and random effects models. Risk of bias was assessed using $I^2$ for heterogeneity. Randomized controlled trials and cohort studies were included. The study population was defined as adults over the age of 18 without cognitive impairment unrelated to HIV. Studies needed to run at least 3 months to be included.

**RESULTS:** Eight studies (N = 3,303) were included in the systematic review. Four studies (N = 316) were included in the quantitative analysis. Three of the eight studies reported a positive association between CPE score and NPZ-4 or GDS and one study reported a negative association between CPE and NPZ-3. The meta-analysis found HIV regimens with higher CPE score did not influence NPZ-4 or GDS (standardized mean difference (SMD) 0.10 [95% CI: -0.19, 0.38]). The I2 score was 22% (p=0.26).

**DISCUSSION:** HIV ART regimens with high CPE score did not have a significant effect on slowing cognitive impairment in patients with HIV. This study has several limitations, including paucity of randomized controlled trials available and the variety of ART regimens used between studies.

**OTHER:** The authors have no conflicts of interest, received no funding, and have no registration.

## PHARMACOKINETICS/ PHARMACODYNAMICS/DRUG METABOLISM/DRUG DELIVERY

**570. Assessing the evidence behind CYP2D6 inhibitor classifications; a systematic review** Emily J. Cicali, Pharm.D., *D. Max Smith III, Pharm.D.*, Benjamin Q. Duong, Pharm.D., Lukas Kovar, Pharmacist Candidate, Larisa H. Cavallari, Pharm.D. and Julie A. Johnson, Pharm.D.; Department of Pharmacotherapy and Translational Research, Center for Pharmacogenomics, College of Pharmacy, University of Florida, Gainesville, FL

**BACKGROUND:** CYP2D6 is responsible for metabolizing 25% of medications and CYP2D6 inhibitors are commonly prescribed. The Food and Drug Administration (FDA) classified 23 drugs as strong (n=5), moderate (n=5), and weak (n=13) inhibitors. Clinical relevance is clear for strong inhibitors but not for moderate and weak inhibitors.

The objective was to examine the literature on the effects of CYP2D6 inhibitors on the area under the curve (AUC) of CYP2D6 substrates in humans to identify if the FDA classifications are supported by publicly available primary literature.

**METHODS:** A systematic review was conducted using FDA labels and PubMed (inception to December 2017). Search terms were: (moderate OR weak inhibitors) AND (sensitive OR moderate-sensitive substrates) AND humans AND (pharmacokinetics OR CYP2D6 OR drug interaction) with individual drug names inserted per FDA classifications. Two authors independently reviewed results with disagreements resolved by a third. Study quality was appraised by meeting the following criteria: conducted in humans, reported substrate AUC +/- the inhibitor. Case reports were excluded. The calculated fold-change in AUC was compared with the FDA-defined AUC thresholds of >2-5 and 1.25-2 for moderate and weak inhibitors, respectively.

**RESULTS:** 57 of 800 reviewed articles were included, which resulted in 84 inhibitor-substrate pairs. 69% of inhibitors matched the FDA-definitions. When research design and clinical criteria (i.e., inhibitor at steady state, clinically relevant dose, inhibitor-substrate pair affected by one CYP450 enzyme) were applied as inclusion criteria (n=55 pairs), the match improved to 82%. Desvenlafaxine did not exhibit inhibitory effects at clinically relevant doses. These data indicate cimetidine and fluvoxamine, FDA-defined moderate inhibitors, should be reclassified as weak inhibitors.

**DISCUSSION:** The additional criteria improved the consistency between the FDA classification and published literature of CYP2D6 inhibitors. Previous data indicated AUC changes found with weak inhibitors are unlikely to result in clinically relevant effects for drugs lacking a narrow therapeutic index.

**OTHER:** N/A

## PULMONARY

**571. Efficacy and safety of revefenacin, a long-acting muscarinic antagonist for nebulization from phase 3 trials in patients with moderate to very severe chronic obstructive pulmonary disease** Gary Ferguson, MD[1], Chris Barnes, Ph.D.[2], Srikanth Pendyala, MD[2], Glenn Crater, MD[2], *Candice Clay*, *Ph.D.*[2]; [1]Pulmonary Research Institute of Southeast Michigan, Farmington Hills, MI [2]Theravance Biopharma US, Inc, South San Francisco, CA

**BACKGROUND:** Revefenacin, a once-daily, lung-selective, long-acting muscarinic receptor antagonist, has been shown to produce significant bronchodilation in patients with chronic obstructive pulmonary disease (COPD) in phase 2 trials. We report the efficacy and safety data from three phase 3 randomized trials.

**METHODS:** Safety and efficacy were evaluated in patients with moderate to very severe COPD in 2 identical, 12-week, placebo-controlled studies (Study 0126, N=619; Study 0127, N=611), and an active-controlled, 52-week safety trial (Study 0128, N=1055). Revefenacin 88 and 175μg were compared with placebo (Studies 0126 and 0127) and tiotropium 18μg (Study 0128). Endpoints were 24-h bronchodilation effect (trough $FEV_1$), peak $FEV_1$ change from baseline to day 1, overall treatment effect $FEV_1$ (OTE $FEV_1$), and assessment of safety and tolerability. Labs, electrocardiograms (ECGs), and adverse events (AEs) were collected.

**RESULTS:** In Studies 0126 and 0127, revefenacin 88 and 175μg significantly increased trough $FEV_1$ and OTE $FEV_1$ compared with placebo (all $p$ values ≤0.001). In Study 0128, significant increases from baseline in trough $FEV_1$ were demonstrated for revefenacin 88 and 175μg groups and tiotropium over the 52-week treatment period. No significant findings in labs or ECGs were observed in any of the studies. AEs, serious AEs, and instances of major adverse cardiac events were comparable among treatment groups of each study, with low incidences of antimuscarinic AEs. In the 0128 study, numerically fewer COPD exacerbations (n [%] patients) were observed with revefenacin 175μg (73 [21.8%]) than with 88 μg (107 [29.4%]) or tiotropium (100 [28.1%]).

**DISCUSSION:** Revefenacin, administered once daily via a standard jet nebulizer at doses of 88 and 175μg, clinically and statistically significantly produced sustained bronchodilation with limited systemic AEs.

**OTHER:** Revefenacin was well tolerated and had a favorable benefit-risk profile for long-term use for the nebulized treatment of COPD.

## CASE REPORTS

## ADR/DRUG INTERACTIONS

**572. A case report of enzalutamide induces liver enzyme elevation in metastatic prostate cancer patient** *Hui-Hsuan Lu*, *Bachelor's degree*, Ya- Fang Cheng, Master degree and Tzu-Cheng Tsai, Master Degree; Department of Pharmacy, Chang Gung Memorial Hospital Linkou Branch, Tao-yuan, Taiwan

**INTRODUCTION:** Enzalutamide is a second-generation androgen receptor inhibitor approved for the treatment of metastatic castrate-resistant prostate cancer. The adverse effect of enzalutamide are musculoskeletal pain, falls, and seizure. There was no report of enzalutamide induced liver enzyme elevation in the past, this case is very rare and might be the first one reported.

**CASE:** Our patient is a 64years old male with a newly diagnosis metastatic prostatic cancer stage T4N1M1b. He started enzalutamide 160mg once daily since 2017/11/21. The concomitant medications included Tamsulosin and Degarelix. Patient denied hepatitis history, no herbal medicine using, no alcohol consumption and no acupuncture. 12/21 Patient had Grade 2 Alanine aminotransferase (ALT) and aspartate aminotransferase (AST) increased. Enzalutamide dose was reduced to 80mg once daily. 12/28 Patient had Grade 3 AST/ALT elevation with fatigue, mild malaises and withheld using enzalutamide .Gastroenterologist diagnosed acute hepatitis, and prescribed silymarin 150mg three times a day to him. 1/25 Patient's fatigue and malaise improved and AST/ALT decreased.

| Lab data | 11/13 | 12/21 | 12/28 | 01/25 |
|---|---|---|---|---|
| AST(u/L) | 38 | 158 | 432 | 34 |
| ALT(u/L) | 44 | 198 | 721 | 30 |
| Total Bilirubin(mg/dl) | 1.4 | | 1.1 | 1.2 |

12/26 Hepatitis B virus surface antigen(HBsAg) ,A-hepatitis B core (HBc) Immunoglobulin (IgM): Nonreactive Anti-HBs: positive

**DISCUSSION:** The severity of this event is 3 by Naranjo scoring. This is a possible adverse event causing by enzalutamide. Our patient had a Grade 3 AST/ALT elevation after receiving enzalutamide for 5 weeks, and the liver function became normal after discontinuing enzalutamide. There is no drug-drug interaction between enzalutamide and degarelix. Concurrent use of Enzalutamide(CYP3A4 inducer) and tamsulosin (CYP3A4 substrate) did not affect Enzalutamide concentration. Unlike abiraterone or bicalutamide may cause hepatitis or liver enzyme elevation, enzalutamide had no hepatic adverse event reported before.

**CONCLUSION:** The causality of hepatic adverse event by enzalutamide cannot be ruled-out. This case report is to remind clinicians while using enzalutamide.

**573. Probable ceftaroline-induced thrombocytopenia: a case report** Rachel S Britt, Pharm.D.[1], Jeffrey C Pearson, Pharm.D.[1], Monica V Mahoney, Pharm.D., BCPS-AQ ID[1], *Alexa A Carlson, Pharm.D., BCPS*[2]; [1]Department of Pharmacy, Beth Israel Deaconess Medical Center, Boston, MA [2]Department of Pharmacy and Health Systems Sciences, Bouvé College of Health Science-School of Pharmacy, Northeastern University, Boston, MA

**INTRODUCTION:** This report describes a probable case of thrombocytopenia as a result of ceftaroline therapy.

**CASE:** An 83-year-old woman was admitted for methicillin-resistant *Staphylococcus aureus* (MRSA) endocarditis and received six weeks of daptomycin. Three days after treatment completion, she re-presented with dyspnea, fever, and encephalopathy and was found to have recurrent MRSA bacteremia and a vegetation on the right ventricular pacemaker lead. She was initially treated with vancomycin, but transitioned to ceftaroline due to persistent bacteremia and a vancomycin minimum inhibitory concentration (MIC) of 2 μg/mL. Eight days into ceftaroline therapy, she developed thrombocytopenia (platelets <150,000 cells/μL, nadir 129,000 cells/μL). To prepare for discharge, she was transitioned to daptomycin, and the thrombocytopenia resolved over the next week. She was subsequently transitioned back to ceftaroline due to the development of a rash, transaminitis, and eosinophilia while on daptomycin. She again developed thrombocytopenia three days into therapy (platelets nadir 96,000 cells/μL). A Naranjo scale of six revealed a probable association between ceftaroline administration and thrombocytopenia. Considering the patient had completed four weeks of appropriate therapy and had a recent isolate with a vancomycin MIC of 1 μg/mL, vancomycin was restarted, and her platelets increased through discharge, six days after ceftaroline discontinuation. The patient did not experience any adverse clinical effects from the transient thrombocytopenia.

**DISCUSSION**: Current evidence describing the causative association between ceftaroline and thrombocytopenia is limited. Phase III trials of ceftaroline reported a low incidence of thrombocytopenia (<2%). Several small, retrospective studies also show similar incidence rates. To our knowledge, this is the first case report that describes this probable ceftaroline adverse drug reaction in detail.

**CONCLUSION:** We describe the first probable (Naranjo scale 6) ceftaroline induced thrombocytopenia case that was reversible upon drug discontinuation. Further studies are needed to establish a causative association between ceftaroline and thrombocytopenia.

**574. Rare carbamazepine deinduction phenomenon causes delayed viral clearance during hepatitis c treatment** *Jennifer E Stark, Pharm.D., BCPS* and Jennifer Cole, Pharm.D., BCPS, BCCCP; Department of Pharmacy, Veterans Health Care System of the Ozarks, Fayetteville, AR

**INTRODUCTION:** A rapid virologic response is expected with the newest direct acting antiviral (DAA) treatments for hepatitis C virus (HCV), with an undetectable viral load by week 4 being typical. A delayed viral response with DAA treatment may indicate noncompliance or decreased efficacy, resulting in the need for prolonged treatment. Carbamazepine has known drug-drug interactions (DDI) as a CYP3A4 inducer, however DDIs can be prolonged well past the drug's elimination half-life due to slow rebound of enzyme production; deinduction. This report illustrates the impact of this unique deinduction DDI with DAA therapy.

**CASE:** Treatment with ledipasvir/sofosbuvir plus ribavirin was planned for a 63 year-old treatment-naïve patient with chronic HCV infection. No baseline HCV resistance was identified. Prior to starting HCV treatment, a significant DDI was identified with patient's concomitant carbamazepine, resulting in decreased levels of ledipasvir and sofosbuvir. Patient agreed to stop carbamazepine, start divalproex, and wait 2 days before starting HCV treatment. HCV viral load at baseline was 6.25 log, treatment week 3 was 2.2 log, and treatment week 5 was 1.54 log. Patient confirmed adherence and serum drug levels confirmed no carbamazepine and a therapeutic valproic acid level. Undetectable HCV viral load occurred at treatment week 7, and HCV treatment was extended due to slow on treatment response.

**DISCUSSION:** The term deinduction refers to the time course for the enzymes or drug transporters to return to normal activity and is delayed beyond the time required for drug clearance. One paper reported the deinduction process should be completed within 2 weeks after carbamazepine is discontinued. This likely contributed to slow viral clearance which resulted in prolonged HCV treatment.

**CONCLUSION:** The case illustrates a clinically significant consequence of carbamazepine deinduction occurring after drug discontinuation. Clinicians must consider the impact of enzyme deinduction on concomitant medications even after expected clearance of the drug.

**575. Acute pancreatitis episode after dose increase of dulaglutide in a patient with a remote history of pancreatitis: a case report** *Heather Folz, Pharm.D.*; Department of Pharmacy, Johns Hopkins Bayview Internal Medicine, Baltimore, MD

**INTRODUCTION:** While data suggests that glucagon-like peptide 1 receptor agonists (GLP-1 RAs) may increase risk for pancreatitis, results have been mixed. An analysis of dulaglutide's pancreatic safety showed incidence rates similar to placebo; however, patients with a

history of pancreatitis were excluded. Due to limited data, dulaglutide's package insert advises consideration of other antidiabetic therapies in patients with a history of pancreatitis. This case report describes an episode of acute pancreatitis in a patient treated with dulaglutide with a remote history of pancreatitis.

**CASE:** A 54-year-old female presented to the emergency department with complaints of a 2-day history of burning abdominal pain, reported to be similar to an idiopathic episode of pancreatitis eight years ago. Her history included type 2 diabetes diagnosed five years ago. She was prescribed dulaglutide 24 weeks prior to presentation. Elevated lipase of 937 U/L on admission and results from her computed tomography led to diagnosis of acute, uncomplicated pancreatitis. Common causes were excluded as potential etiology, but it was noted that dulaglutide was increased to 1.5 mg/week four weeks prior. Dulaglutide was stopped on admission. She was discharged after six days with normal lipase at follow up.

**DISCUSSION:** Research shows that over 30 percent of patients who experienced pancreatitis develop prediabetes and/or diabetes, making them a significant population. In contrast to safety results of a large meta-analysis of GLP-1 RAs, the timeline of events suggests that our patient's pancreatitis may have been triggered by the increase in dulaglutide dose. Patients with a history of pancreatitis, may be more susceptible to this incretin-associated risk but have been excluded from studies.

**CONCLUSION:** Until more is known about the safety of GLP-1 RA therapy in patients with a history of pancreatitis, alternative therapy should be considered in this population. If initiated, patients should be monitored closely for signs and symptoms of pancreatitis.

**576. Altered mental status with sacubitril/valsartan: a case report** Elizabeth Cook, Pharm.D., AE-C, BCACP, CDE, *Jessica Wooster, Pharm.D.*, Denver Shipman, Pharm.D.; Department of Clinical Sciences, The University of Texas at Tyler, Ben and Maytee Fisch College of Pharmacy, Tyler, TX

**INTRODUCTION:** Sacubitril/valsartan is an angiotensin receptor-neprilysin inhibitor (ANRI) composed of the neprilysin inhibitor, sacubitril, and the angiotensin II receptor blocker, valsartan. Neprilysin degrades bradykinin, natriuretic peptides, adrenomedullin, and beta-amyloid proteins, the latter of which are associated with development of Alzheimer-type dementia. ANRIs have proven beneficial in heart failure with reduced ejection fraction (HFrEF), but concern arises that sacubitril/valsartan may cause beta-amyloid affiliated cognitive decline.

**CASE:** A 31-year-old African American female with HFrEF was admitted after a seven-day history of confabulation, paranoia, delusions, audiovisual and tactile hallucinations, insomnia and nighttime wandering. The patient had no documented psychiatric diagnoses. She was stabilized on sacubitril/valsartan 24/26 mg twice daily for two months prior and symptoms presented seven days following titration to 49/51 mg twice daily. Symptoms remitted following self-discontinuation of sacubitril/valsartan, but returned one day after resuming therapy as recommended by her primary care physician. The symptoms escalated and the patient was then admitted for inpatient treatment. Upon admission, vital signs and laboratory tests were unremarkable, ruling out infectious processes and illicit substance use. Diagnostic procedures were unremarkable, with exception of cranial CT scans, depicting intracranial volume loss abnormal for age with commensurate mild ventricular enlargement. Sacubitril/valsartan was discontinued inpatient, symptoms resolved and intolerance was documented in the medical record.

**DISCUSSION:** The association of sacubitril/valsartan with AMS was categorized as "probable" per the Naranjo Scale. Literature surrounding sacubitril/valsartan lacks documentation of events related to AMS. Limited reports may be due to the lack of systematic cognitive assessment during sacubitril/valsartan's approval process. Results of the ongoing PERSPECTIVE trial investigating changes in cognition and intracranial imaging between patients with HFrEF randomized to either sacubitril/valsartan or valsartan alone are still pending, but may provide further insight.

**CONCLUSION:** Due to the temporal relationship of symptoms and escalation of sacubitril/valsartan dose, we recommend monitoring cognitive function with initiation and titration of therapy.

## CARDIOVASCULAR

**577. Drug interaction with amiodarone 400mg and rivaroxaban resulting in elevated prothrombin time: a case report** *Erika L. Hellenbart, Pharm.D., BCPS*, Jaclynne R. Metayer, Pharm.D., Vicki L. Groo, Pharm.D.; College of Pharmacy Department of Pharmacy Practice, University of Illinois at Chicago, Chicago, IL

**INTRODUCTION:** The drug interaction between low dose amiodarone and rivaroxaban has been well documented, however, little evidence exists regarding the effects of higher dose amiodarone on rivaroxaban and PT levels.

**CASE:** We report a case of a 76 year-old African-American male with non-ischemic cardiomyopathy, atrial fibrillation, ventricular tachycardia (VT), hepatitis C with cirrhosis (Childs-Pugh A) on rivaroxaban 20mg daily. He was started on amiodarone 400mg daily for recurrent VT episodes and presented for ICD testing four days later. Five hours after amiodarone and rivaroxaban dosing during admission, PT/INR increased from 34.9/3.3 to 67.2/7.6. Rivaroxaban was held, PT returned to baseline, warfarin started, PT/INR > 120/8 at follow up and was discontinued. Rivaroxaban was successfully resumed once amiodarone dose was reduced to 200mg daily with PT values similar to that of rivaroxaban alone, resulting in a drug interaction probability scale (DIPS) score of 8, indicating a causal relationship. Stollberger et al previously described a case where prolonged use resulted in a fatal cerebral bleed and PT on admission of 54.0.

**DISCUSSION:** This case adds to the literature, the effect amiodarone 400mg when used with rivaroxaban can have on PT levels. Our patient did not experience bleeding, but did have therapy interrupted, changed, and interrupted again, increasing risk of bleeding and stroke. The effect the patient's liver disease had on this interaction is unknown, although Childs Pugh A has not been documented to

significantly impact the metabolism of rivaroxaban. Comparing PT and chromogenic Xa levels may be useful in future cases of this interaction.

**CONCLUSION:** We may discern that the interaction with rivaroxaban and amiodarone 400mg or greater can increase PT levels higher than those produced with low dose amiodarone. Clinicians should use caution if using these agents concomitantly and monitor for signs and symptoms of bleeding.

**578. Use of argatroban-based purge solutions for percutaneous ventricular assist devices** *Shannon Lawson, BS Pharmaceutical Sciences, Pharm.D. Candidate 2019*[1], Margaret Lowery, BS Pharmaceutical Sciences, Pharm.D. Candidate 2019[1], Rickey Evans, Pharm.D., BCPS[2], Jenna Cox, Pharm.D., BCPS, BCCCP[3]; [1]South Carolina College of Pharmacy, Columbia, SC [2]University of South Carolina College of Pharmacy, Columbia, SC [3]Department of Pharmaceutical Services, Palmetto Health Richland, Columbia, SC

**INTRODUCTION:** Impella catheters are percutaneous ventricular assist devices (pVAD) indicated for short-term mechanical circulatory support. Impella catheters require a purge solution to flow through the catheter into the blood pump to prevent blood from entering the motor and device thrombosis. Purge solutions are typically composed of a dextrose solution and heparin. Patients may require additional systemic anticoagulation to reach target coagulation parameters, reducing the risk of thrombotic complications, exposing patients to risk of heparin-induced thrombocytopenia (HIT). While manufacturer recommendations advise against adding non-heparin anticoagulants to purge solutions, use of argatroban-based purge solutions has been described in case reports for three patients.

**CASE:** Nine patients who received an argatroban-based purge solution during Impella support between 2012 and 2018 were included. Demographic information, indication for pVAD, presence of additional anticoagulants/antithrombotics, HIT testing, coagulation testing, and adverse events were collected. In each case, suspicion of HIT prompted the switch from a heparin- to argatroban-based purge solution. All patients received argatroban systemically and in the purge solution. Of the eight patients tested for HIT, two had positive results and expired. Two of the six patients with negative HIT testing expired. HIT status for one patient was indeterminate due to elevated bilirubin. Platelet nadirs prior to argatroban initiation averaged at 60,000/mL. Average duration of argatroban-based purge solutions was 4.3 days. Three patients experienced adverse events including: deep vein thrombosis, hematuria, and gastrointestinal bleeding.

**DISCUSSION:** While the majority of institutions (83.3%) have developed strategies for management of patients receiving Impella support in the context of HIT, data supporting the use of direct thrombin inhibitors (e.g., argatroban) in purge solutions are limited. This is the largest case series evaluating the use of argatroban-based purge solutions to date.

**CONCLUSION:** While further studies are needed to substantiate efficacy and safety of argatroban-based purge solutions in patients receiving Impella support, they remain an option.

## CRITICAL CARE

**579. Case report: elevated INR in the setting of increased coagulopathy** Hayley Tatro, Pharm.D.[1], Leslie A. Hamilton, Pharm.D., BCPS, BCCCP, FCCP, FCCM[2], J. Russell Langdon, MD[3], *A. Shaun Rowe, Pharm.D., BCPS, BCCCP, FNCS*[2]; [1]Department of Pharmacy, University of Tennessee Medical Center, Knoxville, TN [2]Department of Clinical Pharmacy, University of Tennessee Health Science Center College of Pharmacy, Knoxville, TN [3]University of Tennessee Medical Center, Knoxville, TN

**INTRODUCTION:** Thromboelastography (TEG) is a test that allows for evaluation of the complete coagulation system. Unlike traditional coagulation tests (e.g. prothrombin time, activated partial thromboplastin time, platelet function, etc.) TEG allows a clinician to appraise the whole coagulation process in a single test. TEG has been utilized to guide the management of coagulopathy in trauma patients, orthoptic liver transplantation, obstetrics, and other disease states. In this case, we describe the use of TEG in the management of a patient with liver failure, elevated INR, and thrombosis.

**CASE:** A 30-year-old male with a history of atrial fibrillation and cardiomyopathy was diagnosed in September 2017 with a right ICA stroke, received mechanical thrombectomy, and discharged on warfarin. On the same day he was discharged, he presented to the emergency department again and was found to have a left ICA stroke. He again received mechanical thrombectomy. During his hospital course, the patient developed lower limb ischemia and acute liver failure with an INR of 10. A TEG was performed to determine platelet function and coagulation. The patient was found to be hypercoagulable despite an elevated INR and a heparin drip was initiated. The patient was ultimately discharged home on warfarin three months after admission.

**DISCUSSION:** Although many patients with liver failure will have prolonged PT/INR, it is not necessarily a reliable marker for coagulation status. In this patient with a past medical history significant for atrial fibrillation, cardiomyopathy, and multiple embolic events, a TEG determined that the patient was hypercoagulable despite an elevated INR.

**CONCLUSION:** An elevated INR in a patient with acute liver failure may not be predictive for coagulopathy. TEG evaluates the whole coagulation system and can be utilized to determine whether such a patient is at risk for bleeding or clotting events.

**580. Guanfacine for agitation in two critically ill medical patients – a case series** *Allison Oswalt, Pharm.D.*[1], Kimberly Means, Pharm.D.[2]; [1]College of Pharmacy, University of Arkansas for Medical Sciences, Little Rock, AR [2]Department of Pharmacy Services, Virginia Commonwealth University Health System, Richmond, VA

**INTRODUCTION:** Guanfacine is a centrally acting alpha-2 receptor agonist indicated for hypertension and attention deficit hyperactivity disorder. It has been used in one case report thus far for sedation in a critically ill patient with refractory anxiety and agitation after cardiac surgery. Many patients, especially those with prolonged hospital courses, have difficulty weaning from sedation which can lead to increased length of stay in the intensive care unit.

**CASE:** Two patients with refractory agitation were successfully treated with enteral guanfacine. The first patient presented with respiratory failure in the setting of pneumonia. Her course was complicated by long-term use of benzodiazepines and opioids with difficulty weaning from these agents secondary to agitation. The second patient presented with status epilepticus due to anti-N-methyl-D-aspartate receptor encephalitis with difficulty weaning from sedation and persistent agitation. Both patients were treated with enteral guanfacine resulting in a substantial reduction in sedative doses. Neither patient experienced adverse effects associated with guanfacine administration or withdrawal.

**DISCUSSION:** This is the first report regarding the successful use of enteral guanfacine for refractory agitation in critically ill medical patients. Clonidine, another central alpha-2 agonist, has been used to facilitate weaning from continuous infusion sedatives. However, guanfacine offers several advantages over clonidine including increased selectivity for the 2A subunit of alpha-2 receptors. This selectivity lessens the likelihood for hemodynamic instability and potentiates central nervous system effects including sedation and anxiolytic properties. Furthermore, guanfacine has a longer half-life than clonidine which may reduce or eliminate rebound side effects following discontinuation. It is available in multiple tablet sizes and formulations including both extended and immediate release preparations to allow for ease of administration.

**CONCLUSION:** Guanfacine may be considered for refractory agitation in critically ill medical patients. Further studies should be done to assess the efficacy and safety of this therapeutic intervention.

## EMERGENCY MEDICINE

**581. Low-dose propofol as a first-line treatment for refractory migraine headache in the emergency department: a case report**

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**INTRODUCTION:** Propofol is a sedative hypnotic that has been proposed as a treatment option for migraine headache refractory to standard therapies. While studies have described the efficacy of this treatment, there is a paucity of data on the optimal dosing when utilized before other parenteral agents. We report a case of refractory migraine headache successfully treated first-line with propofol using a lower total dose than that described in previous studies.

**CASE:** A 58 year old female with a history of migraine headaches presented to the emergency department with a chief complaint of headache, photophobia, nausea and vomiting. Treatment with sumatriptan and naproxen at home within 24 hours before presentation was unsuccessful. She described her pain as a 10/10, worsened with head movement and laying in a supine position. Physical exam findings were benign, and all labs were within normal limits. Propofol 10mg intravenously was administered every 5 minutes until a pain score of zero was achieved. After a total of four doses (40mg or 0.5mg/kg body weight), the patient reported a pain score of zero and was able to return to baseline function. She was discharged home within two hours of treatment initiation.

**DISCUSSION:** Compared to other parenteral agents for migraine headache, propofol offers advantages with its fast onset, but may require additional monitoring and supervision due to its sedative, respiratory, and hemodynamic effects. Prior studies and case reports using propofol first-line for refractory migraine headache have not described the correlation between total dose and patient disposition. This case demonstrates efficacy at a lower total dose which may reduce the utilization of healthcare resources during treatment and expedite patient discharge compared to other pharmacologic options.

**CONCLUSION:** Treatment of refractory migraine headache in the emergency department with low-dose propofol may be a viable first-line parenteral treatment option.

**582. Two bleeds, too many: use of idarucizumab in two instances of dabigatran-induced life-threatening bleeding in one patient**

*Kimberly Friend, Pharm.D.*, Nadia Awad, Pharm.D., BCPS; Department of Pharmacy, Robert Wood Johnson University Hospital, New Brunswick, NJ

**INTRODUCTION:** Idarucizumab has been used in clinical practice for reversal of dabigatran-induced life- threatening bleeding. Anticoagulant reversal effects can be measured via direct thrombin time (dTT) or ecarin clotting time (ECT), which are sensitive at low concentrations of dabigatran.

**CASE:** An 81-year-old female on dabigatran as outpatient therapy presented to the emergency department with severe epistaxis following a traumatic fall. Her initial vital signs were: blood pressure of 227/93 mmHg, heart rate of 72 beats per minute and O2 saturation 87% on room air. Multiple attempts were made to control the bleeding but were unsuccessful, warranting endotracheal intubation. The decision was made to administer idarucizumab, as results of thrombin time yielded prolongation with no clot formation. Following administration of idarucizumab, thrombin time reflected surrogate correction at 15.7 seconds (normal range, 11.4 to 16.7 seconds). Computed tomography of the head revealed a subdural hemorrhage. The patient had no repeat episodes of epistaxis or hematemesis throughout her hospital stay, and was successfully discharged home. Six months later, the patient again presented to the emergency department with life-threatening gastrointestinal bleed, and it was discovered that she was still maintained on dabigatran as outpatient therapy, thereby requiring repeat administration of idarucizumab.

**DISCUSSION:** In the absence of laboratory parameters, and in the clinical setting of life-threatening hemorrhage in patients with documented outpatient dabigatran therapy, it may be reasonable to consider administration of the antidote in this acute setting. Although no contraindications are outlined in the idarucizumab prescribing information, monoclonal antibody administration carries the risk of immunogenic reactions. In this case, the patient was inadvertently maintained on dabigatran despite having a history of life-threatening bleeding secondary to the drug, warranting repeat administration of idarucizumab.

**CONCLUSION:** This is the first documented case report of using idarucizumab in two separate instances of dabigatran-induced life-threatening bleeding in the same patient.

**583. Case report of sustained low efficiency hemodialysis for treatment of severe lactic acidosis after substantial metformin overdose** *Ruchita Amin, Pharm.D.*[1], Rachel Wilkinson, Pharm.D., BCCCP[2], Brian Hawkins, MD[3], Nathan Wilds, MD[4], Konrad Stepniakowski, MD[5], Jaclyn Stoffel, Pharm.D.[1]; [1]Department of Pharmacy, Methodist University Hospital, Memphis, TN [2]Department of Pharmacy, Methodist University Hosptial, Memphis, TN [3]Department of Emergency Medicine, Methodist University Hospital, Memphis, TN [4]Department of Critical Care, Methodist University Hospital, Memphis, TN [5]Department of Nephrology, Methodist University Hospital, Memphis, TN

**INTRODUCTION:** Metformin associated lactic acidosis (MALA) is a concentration based toxicity. Metformin distributes into peripheral tissues, leading to a redistribution phenomenon when utilizing hemodialysis for MALA treatment. Previous case reports highlight use of continuous renal replacement therapy in MALA treatment, however there is a paucity of literature discussing corresponding metformin levels and potential rebound effect. This case report describes the utilization of sustained low efficiency hemodialysis (SLED) and evaluation of serum metformin levels for treatment of a massive metformin overdose.

**CASE:** A 35-year old male with type 2 diabetes mellitus and schizophrenia presented for abdominal pain. He initially did not disclose acute ingestion, but later admitted to consuming 178 grams of metformin. Initial vital signs were stable except for hypothermia; however, he later became hypotensive and required a norepinephrine drip. Initial labs revealed anion gap metabolic acidosis with elevated lactic acid (19.1mmol/L) concerning for MALA. Treatment with bicarbonate infusion was insufficient leading to emergent SLED initiation. Following 23 hours of SLED, metabolic acidosis corrected and serial serum metformin levels consistently declined (from 77 to 1.2 mcg/mL). Up to 48 hours post-SELD, a rebound in metformin levels was not detected. By day 8, patient regained renal function and was discharged with full recovery.

**DISCUSSION:** Current MALA treatment encompasses acidosis correction with bicarbonate escalating to hemodialysis if needed. There is still sparse literature surrounding utility of SLED and corresponding metformin levels. In our case, MALA was treated with 23 hours of SLED resulting in full recovery of acidosis and no rebound increase in metformin levels. Patient retained renal function and was discharged on day 8. Thus, early initiation and extended duration of SLED is efficacious for MALA treatment.

**CONCLUSION:** Sustained low-efficiency hemodialysis is efficacious for the treatment of severe MALA secondary to acute ingestion without a rebound in serum metformin levels.

## ENDOCRINOLOGY

**584. The resurrection of pioglitazone: case reports of low-dose pioglitazone in type 2 diabetes** *Kam Capoccia, Pharm.D.*; Department of Pharmacy Practice, Western New England University College of Pharmcay and Health Sciences, Springfield, MA

**INTRODUCTION:** Thiazolidinediones are not commonly used in the treatment of type 2 diabetes (T2D) due to adverse effects of weight gain, fluid retention, and edema. Evidence-based guidelines recommend these insulin sensitizers as add-on therapy. Four clinical trials describe the utility of pioglitazone 7.5-15mg with statistically significant reduction in A1C without significant adverse effects. These three case reports highlight the addition of low dose pioglitazone as a viable option in the armamentarium of T2D.

**CASE:** Three patients with T2D and elevated blood glucose values despite multiple antihyperglycemic agents struggled to achieve appropriate A1C goals safely. All 3 patients were initiated on pioglitazone 15mg as either the fourth or fifth antihyperglycemic agent. All 3 were on basal insulin and maximum doses of metformin. Other antihyperglycemic agents used were bolus insulin, glimepiride, and GLP-1 agonists. Baseline A1C was above the American Diabetes Association goals. At 3 months, A1C decreased by 0.3-0.6% and at 6 months A1C decreased by 0.4-1.3%. Insulin doses were subsequently decreased to avoid hypoglycemic events. No adverse events were reported.

**DISCUSSION:** These 3 cases demonstrate that pioglitazone 15mg was effective in these patients in lowering blood glucose safely without the common adverse effects of weight gain, fluid retention, and edema. Low-dose pioglitazone is generic, inexpensive, and available orally, making it a viable treatment option in T2D. Pioglitazone should not be used in NYHA Class III or IV heart failure or in those at increased risk of fracture. Limitations include other factors that could influence a change in A1C. All 3 patients did not report any changes in lifestyle modifications.

**CONCLUSION:** Low-dose pioglitazone significantly lowers A1C in people with T2D without the expected side effects of weight gain, fluid retention, or edema. Pioglitazone 15mg should be resurrected as a viable treatment option in appropriate candidates when a third or fourth line antihyperglycemic agent is needed.

## HEMATOLOGY/ANTICOAGULATION

**585. Pegylated carboxyhemoglobin bovine for emergent tissue oxygenation in anemic Jehovah's Witness patients: a case series** *Sean McConachie, Pharm.D., BCPS*[1], Sheila Wilhelm, Pharm.D., FCCP, BCPS[2], Krista Wahby, Pharm.D., BCCCP[3], Zinah Almadrahi, Pharm.D.[3]; [1]Eugene Applebaum College of Pharmacy & Health Sciences, Wayne State University, Detroit, MI [2]Department of Pharmacy Practice, Wayne State University, Eugene Applebaum College of Pharmacy & Health Sciences, Detroit, MI [3]Harper University Hospital, Detroit Medical Center, Detroit, MI

**INTRODUCTION:** Pharmacologic management of anemic Jehovah's Witnesses (JW) patients who refuse transfusion is limited to stimulation of hematopoiesis by iron and erythropoietin supplementation, which is characteristically delayed. Hemoglobin-based oxygen carriers (HBOCs) represent the only pharmacologic modality capable of acutely increasing a patient's oxygen carrying capacity; however, there

are currently no FDA-approved HBOCs available in the United States. Herein, we report three cases of anemic JW patients in which the experimental HBOC, PEGylated carboxyhemoglobin bovine (Sanguinate), was requested under emergency circumstances.

**CASE:** Three severely anemic (hemoglobin < 5 g/dL) JW patients presented with post-partum hemorrhage, cardiovascular surgery, and anticoagulant-induced bleeding. All patients received concomitant iron and erythropoietin and were on supplemental oxygen. Two patients received HBOC infusions, while the other patient expired prior to receiving the medication. One patient who received PEGylated carboxyhemoglobin bovine expired secondary to multisystem organ failure after 5 units of medication. The other patient's hemoglobin recovered after receiving 1 unit, and she was discharged in stable condition.

**DISCUSSION:** The limited treatment options available to anemic JW patients may lead to reliance on experimental HBOC therapies. These therapies have been linked in the past to adverse cardiovascular events and mortality. There is little published data with these agents for use in the JW population; however, they represent a potentially life-saving treatment option in the setting of severe anemia. Our patients experienced no adverse effects from the medication; however, two of the patients expired. These cases demonstrate the need for early decision-making by the medical team and pharmacist to ensure the medication is promptly delivered and safely administered.

**CONCLUSION:** PEGylated carboxyhemoglobin bovine may represent a potentially beneficial therapy in the critically anemic JW population. This series demonstrates the complex nature of anemic JW patients and the critical need for further research in to HBOC therapies.

**586. Serotonin release assay (SRA)-negative hit, a newly recognized entity: implications for diagnosis and management** *Eric Johnson, Pharm.D., BCCCP*[1], Komal Pandya, Pharm.D., BCPS[1], George Davis, Pharm.D., BCPS[1], Anand Padmanabhan, MD Ph.D. QIA[2]; [1]Department of Pharmacy, UK HealthCare, Lexington, KY [2]BloodCenter of Wisconsin, Milwaukee, WI

**INTRODUCTION:** Heparin-induced thrombocytopenia (HIT) is a life-and-limb threatening complication of heparin therapy. The serotonin release assay (SRA) is considered the gold-standard confirmatory laboratory test as part of the clinicopathologic diagnosis of HIT, such that a negative result suggests that HIT is extremely unlikely with >90% clinical sensitivity/specificity. However, recent findings suggest that pathogenic HIT antibodies can recognize platelet-bound platelet factor 4 (PF4) and that use of PF4-treated platelets can reveal platelet-activating antibodies not detected in the standard SRA.

**CASE:** We present two separate patients with high probability for HIT based on pretest 4T-scores. In each case, the PF4 ELISA was noted to be positive with optical densities (OD) of 2.1 and 1.38, respectively. In both cases, the SRA was negative. Given the high clinical suspicion, a novel platelet-activation assay called the PF4-dependent P-selectin expression assay (PEA) was used to analyze each sample. Platelet-activating HIT antibodies were detected in each PEA at 67% and 91% in each case, with a positive result indicated at ≥24%.

**DISCUSSION:** The SRA is considered the gold confirmatory standard test for the diagnosis of HIT. However, in recent studies, the diagnostic sensitivity of the SRA has been brought into question. In our two patients, the clinical presentation, strong PF4 ELISA results and rapid recovery of platelet counts upon heparin cessation suggested HIT, but were confounded by false-negative SRA results.

**CONCLUSION:** These cases highlight the limitations of current gold standard confirmatory laboratory testing in HIT, and should alert clinicians to the existence of "SRA-negative HIT". Recognition of this entity is critical to ensure that such patients receive timely therapeutic interventions with non-heparin anticoagulant and results should always be correlated with clinical findings.

**587. Managing the complicated patient requiring anticoagulation: a case report** *Nicole Cieri-Hutcherson, Pharm.D., BCPS*[1], Timothy Hutcherson, Pharm.D.[2], Alyssa Cizdziel, Pharm.D.[2], Allison Englert, Pharm. D.[2], Elizabeth Riegle, Pharm.D.[2], Karen Mlodozeniec, BS Pharm, Pharm.D.[2]; [1]University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY [2]School of Pharmacy, D'Youville College, Buffalo, NY

**INTRODUCTION:** Pharmacists have a valuable role in the management of complicated patients requiring anticoagulation. This case describes the management of an unusually complex hypercoagulable patient.

**CASE:** A 26-year-old Caucasian male with a recent past medical history of deep vein thrombosis (DVT) was admitted to the hospital after developing thrombus extension while managed with rivaroxaban. Social history was positive for opioid use and abuse. He concurrently developed a gastrointestinal bleed likely due to excessive NSAID consumption for thrombus-associated pain in the setting of anticoagulant use. Thrombolysis, although initially recommended upon vascular consult, was contraindicated following the gastrointestinal bleed; warfarin was initiated with heparin infusion bridging anticoagulation for management of the DVT, in light of possible rivaroxaban failure. Hypercoagulability testing reported positive anti-cardiolipin antibodies. The patient subsequently developed laboratory confirmed (PF4 3.413 OD; SRA positive) heparin-induced thrombocytopenia (HIT) and was initiated on argatroban bridging anticoagulation with the addition of warfarin after platelet recovery. The patient was transitioned to fondaparinux and warfarin due to argatroban-associated INR prolongation. Following the second consecutive therapeutic INR, fondaparinux was appropriately discontinued, however, a second DVT was discovered. Differential diagnoses included warfarin failure or HIT with thrombosis (HITT); the patient was discharged on long-term fondaparinux with counseling to reinforce adherence due to social history.

**DISCUSSION:** To our knowledge this is the first case of a patient at risk for non-adherence with possible direct oral anticoagulant failure; antiphospholipid antibody syndrome; gastrointestinal bleeding; HIT(T); and possible warfarin failure requiring resourceful, stepwise anticoagulation management. We propose the development of a decision-

making tool to facilitate practitioners in determining the most feasible therapy options in complex patients requiring anticoagulation.

**CONCLUSION:** It is difficult to recommend appropriate pharmacotherapy when a patient has multiple factors that complicate their anticoagulation management. Evidence-based literature and guideline reviews are required to provide strong recommendations and could be aided by an algorithmic tool.

**588. Four factor prothrombin complex concentrate for warfarin-associated intracranial hemorrhage with an initial inr between 1.4 – 1.9: a case series** Kaitlin Ferguson, Pharm.D., Natalija Farrell, Pharm. D., BCPS, DABAT, *Lindsay Arnold, Pharm.D., BCPS*; Department of Pharmacy, Boston Medical Center, Boston, MA

**INTRODUCTION:** Four factor prothrombin complex concentrate (4F-PCC) use has been established as efficacious for urgent reversal of vitamin K antagonists with an INR ≥ 2 and is first-line therapy in the setting of anticoagulant-associated intracranial hemorrhage (ICH). Current literature, limited to single-centered case series, suggests the use of 4F-PCC for ICH with an INR < 2 may be beneficial in further reducing INR and progression of bleed. Various dosing strategies were employed by each study, including both weight-based and fixed-dosing protocols. We present a case series using 4F-PCC 25 units/kg (maximum of 2500 units) in patients with warfarin-associated ICH and initial INR between 1.4-1.9.

**CASE:** Eleven patients received 4F-PCC with a baseline INR < 2 for the purpose of INR reversal in the setting of warfarin-associated ICH between May 1, 2017 and June 6, 2018. Patient demographics, INR values pre- and post- 4F-PCC, Vitamin K use, and VTE events during admission were collected. Eleven warfarin patients received a total of twelve administrations of 4F-PCC. After administration, all patients had a repeat INR ≤ 1.4 with a median time of 1.5 hours after 4F-PCC. Intravenous phytonadione 10mg was given in nine out of the twelve administrations. Of the eleven total patients, one (9%) experienced a VTE event.

**DISCUSSION:** This case series suggests the use of 4F-PCC when dosed as 25 units/kg was effective at reversing INR to ≤ 1.4, but may correlate with a higher VTE rate than previous literature reports. The VTE rate noted here may be due to the low number of patients=. This warrants consideration of a dose reduction for this indication and further assessment to elucidate implications on VTE rate.

**CONCLUSION:** Administration of 4F-PCC 25 units/kg for warfarin-associated ICH with initial INR between 1.4-1.9 successfully reversed INR to ≤ 1.4, but may lead to unexpected VTE events.

## HIV/AIDS

**589. A case report of possible abacavir-induced hypersensitivity reaction in an HLA-B*5701 negative patient** *Spencer Durham, Pharm. D. BCPS (AQ-ID)*; Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Auburn, AL

**INTRODUCTION:** Severe, life-threatening hypersensitivity reactions to abacavir are a well-known phenomenon in patients positive for the HLA-B*5701 allele. Symptoms appear within the first six weeks and gradually worsen if the drug is not discontinued. Testing for the HLA-B*5701 allele is recommended prior to initiating abacavir. However, the risk of abacavir hypersensitivity in patients HLA-B*5701 negative is not well-defined.

**CASE:** A 59-year-old, HIV-positive Caucasian male was well-controlled on elvitegravir/cobicistat/emtricitabine/tenofovir disoproxil, but renal function was progressively worsening, requiring a regimen change. He had previously tested HLA-B*5701 negative, and was changed to dolutegravir/abacavir/lamivudine. After three weeks of therapy, he began to develop a sore throat, pruritic rash, myalgia, and self-reported fever. The symptoms worsened over several days. Because of his clinical presentation, there was the immediate concern for an abacavir-induced hypersensitivity reaction, so the medication was immediately discontinued, and a repeat HLA-B*5701 test was ordered, but also returned negative. All symptoms resolved after several weeks, and his regimen was changed to elvitegravir/cobicistat/emtricitabine/tenofovir alafenamide.

**DISCUSSION:** Literature reports of abacavir-induced hypersensitivity in patients HLA-B*5701 negative are lacking, and only three other reports could be identified. In this patient, the Naranjo Adverse Drug Reaction Probability Scale demonstrated a score of 6, indicating a "probable" association with dolutegravir/abacavir/lamivudine. It is unlikely the reaction was caused by lamivudine as the patient had been previously treated with it upon initial HIV diagnosis. Although reaction to dolutegravir cannot be excluded, it is also unlikely as the patient experienced no reaction to the related drug elvitegravir, and hypersensitivity to dolutegravir itself appears extremely rate based on literature reports. In addition, the patient had the classic presentation of an abacavir-induced hypersensitivity reaction based on both symptoms and timing.

**CONCLUSION:** Abacavir-induced hypersensitivity reactions in patients HLA-B*5701 negative are extremely rare, but possible. Therefore, clinicians should monitor for hypersensitivity reactions in all patients receiving abacavir.

## INFECTIOUS DISEASES

**590. Edwardsiella tarda bacteremia in untreated hepatitis C: a fatal case report** *Taylor Morrisette, Pharm.D.*[1], Hannah Hewgley, Pharm.D.[2]; [1]Department of Pharmacy, University of Colorado Hospital and Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO [2]Department of Pharmacy, Methodist University Hospital, Memphis, TN

**INTRODUCTION:** *Edwardsiella tarda* is a Gram-negative bacillus that rarely causes bacteremia; however, *E. tarda* bacteremia (ETB) is highly fatal. A recent review concluded that liver cirrhosis in ETB was found to be associated with mortality. To our knowledge, we present the first case in the United States (U.S.) of fatal ETB in a patient with untreated hepatitis C.

**CASE:** A 58-year-old African American male with a medical history of hepatitis C and alcohol abuse presented to our emergency department (ED) with left hand swelling due to a suspected catfish sting. In the ED, the patient was found to have a lactic acid of 16.3 mmol/L, white blood cell count of 1.7 cells/L, AST of 251 units/L, ALT of 99 units/L, and a positive hepatitis C antibody (viral level of 27,900 IU/mL). The patient was admitted to the intensive care unit with a diagnosis of septic shock and empiric antibiotics included meropenem, ciprofloxacin, and linezolid. Finalized blood samples identified pan-susceptible *E. tarda*, however, the patient remained on meropenem and linezolid due to the severity of illness and lack of improvement. Repeat blood cultures drawn on hospital day four were negative. On hospital day six, the patient was made DNR with plans for palliative extubation, however, the patient passed shortly thereafter.

**DISCUSSION:** Patients with hepatobiliary disease are up to 50-66% of the documented ETB population, with a recent literature review concluding that liver cirrhosis was an independent risk factor associated with mortality. As untreated hepatitis C is known to lead to hepatic complications, the patient's untreated hepatitis C was a possible risk factor for the development of his fatal ETB. Early identification and initiation of antimicrobial therapy can potentially improve survival in ETB.

**CONCLUSION:** To our knowledge, this is the first fatal case of ETB in a patient with untreated hepatitis C reported in the U.S.

**591. Case report: *mycobacterium conceptionense* pneumonitis in an HIV-positive patient** *Sarah M. Michienzi, Pharm.D.*[1], Rodrigo Burgos, Pharm.D.[2], Richard M Novak, MD[3]; [1]Department of Pharmacy Practice, Section of Infectious Disease Pharmacotherapy, University of Illinois at Chicago College of Pharmacy, Chicago, IL [2]Department of Pharmacy Practice Section of Infectious Disease Pharmacotherapy, University of Illinois at Chicago College of Pharmacy, Chicago, IL [3]Department of Medicine, College of Medicine, University of Illinois at Chicago, Chicago, IL

**INTRODUCTION:** A number of *Mycobacterium conceptionense* cases are reported in the literature. However, most are outside the US and optimal treatment remains uncertain. Here we report the clinical course and management of *M. conceptionense* pneumonitis in a human immunodeficiency virus (HIV)-positive patient.

**CASE:** The patient is a 47-year-old Black male with HIV diagnosed in 1980s, which was untreated until 2015 when he presented to the emergency department at our institution. His complaints included cough, shortness of breath, and diarrhea. IV ceftriaxone, azithromycin, and trimethoprim-sulfamethoxazole (TMP-SMX) were initiated. CT showed bilateral interstitial and groundglass opacities and a 6mm nodule. On day four, ceftriaxone and azithromycin were discontinued. Induced sputum cultures from day 2 returned acid fast bacilli (AFB) positive. The patient's symptoms improved over admission. On day 11, he was discharged on oral TMP-SMX and prophylactic azithromycin. On day 22, the patient followed at our clinic. At this time, his TMP-SMX course was complete, additional sputums from day 3 and 4 had returned AFB-positive, and azithromycin was switched to 250mg daily. At day 43, his pneumonitis had clinically resolved, *M. conceptionense* diagnosis was confirmed from sputum cultures, and doxycycline 100mg twice-daily was added. Repeat CT and AFB culture were negative. The patient remains profoundly immunosuppressed (CD4/%: 60/6%) due to antiretroviral nonadherence. We plan to continue oral azithromycin and doxycycline until immune reconstitution.

**DISCUSSION:** Similar to other reported cases, the patient was started on broad-spectrum antibiotics, and were tailored once he received a diagnosis of nontuberculous mycobacteria. Macrolides, fluoroquinolones, and doxycycline are commonly reported targeted treatments for *M. conceptionense*. Given few reports in the US, our case is an important addition to the literature.

**CONCLUSION:** This case demonstrates clinical and microbiological cure of *M. conceptionense* pulmonary infection with azithromycin and doxycycline.

**592. Staphylococcus pseudintermedius infections: case report from a man's best friend** Scott Hall, Pharm.D., BCPS[1], *Vanthida Huang, Pharm.D., BSPHM, FCCP*[2]; [1]HonorHealth John C. Lincoln Medical Center, Phoenix, AZ [2]Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ

**INTRODUCTION:** *Staphylococcus pseudintermedius* (MRSP) is a Gram-positive zoonotic organism, part of the natural skin flora of dogs, cats, and other domestic and wild animals. The implementation of matrix-assisted laser desorption/ionization-time of flight (MALDI-TOF) in clinical microbiology labs has increased the identification of this organism. Previously, it had been unrecognized or misidentified as *S. aureus* or as a coagulase-negative Staphylococcus (CNS). However, case reports of such infections in the United States are limited. We present a case of methicillin-resistant *S. pseudintermedius* treated effectively with linezolid.

**CASE:** A 50-year-old male sustained a partial-thickness burn to his left middle finger from boiling water presents one month after debridement with evolving wound necrosis necessitating further amputation. Past medical history includes renal transplant, and depression with anxiety treated with escitalopram and trazodone. Cultures were obtained intraoperatively. An Infectious Diseases consult was obtained, and the patient was empirically placed on daptomycin and piperacillin-tazobactam, noting that despite a normal white blood cell count, the patient was immunosuppressed. Additionally, the patient was a dog owner, displaying small scratches on his right hand attributed to said dog. On hospital day 3, *S. pseudintermedius* was isolated from the wound; resistant to methicillin and susceptible to vancomycin/linezolid. Several options for completing antibiotic therapy on discharge were considered given the limited susceptibility and potential drug interactions. The patient requested immediate discharge. A prescription was given for six days of linezolid 600 mg orally twice daily and instructions to hold his escitalopram and trazodone until after completion of antibiotics.

**DISCUSSION:** MRSP has been shown to be susceptible to typical anti-staphylococcal agents. However, increasing prevalence and resistance

has been documented. Treatment with newer agents [oritavancin, dalbavancin, tedizolid, and delafloxacin] should be considered.

**CONCLUSION:** Methicillin-resistant *S. pseudintermedius* can be effectively treated with available antistaphylococcal agents. Further studies of newer agents is warranted.

**593. Utilization of a mathematical model of middle east respiratory syndrome (MERS-CoV) nosocomial outbreak to determine effective parameters for control** *Yasar Tasnif*, *Pharm.D.*[1], Tamer Oraby, Ph.D.[2], Mustafa Al-Zoughool, Ph.D.[3], Ayesha Araya, Pharm.D. (2019)[1], Hanan Balkhy, MD[3]; [1]College of Health Affairs, Cooperative Pharmacy Program, University of Texas Rio Grande Valley, Edinburg, TX [2]School of Mathematical and Statistical Sciences, University of Texas Rio Grande Valley, Edinburg, TX [3]Department of Community and Environmental Health, College of Public Health and Health Informatics, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia

**INTRODUCTION:** Middle East Respiratory Syndrome-coronavirus (MERS-CoV) has a high fatality rate. In a global collaboration between Saudi Arabia, USA and Canada, a model was constructed to depict the 2015 MERS-CoV nosocomial outbreak in King Abdul Aziz Medical Center, Riyadh, Saudi Arabia. The model was used to estimate parameters related to the outbreak and to test the effect of an infectious disease control plan in the hospital, preventing a spill-out to the community.

**CASE:** *Hypothesis* – Rapid diagnosis of MERS-CoV would be effective in halting the spread of the disease.

*Study design* – The model of the spread of the disease was constructed depicting three types of agents in hospital units (ER, Hospital Wards etc.) and calibrated by data from the outbreak (number of patients, infected patients, health-care workers etc.).

*Methods* – Transition rates between units were estimated via standard independent competing risks model for fully observed data. Susceptible-Exposed-Infected-Removed (SEIR) Model was used to calculate the rates and impact of transmission. The basic reproduction number ($R0$), the average number of secondary infections due to the introduction of an infectious individual was calculated (Next Generation Matrix) to determine the potential of an epidemic or not (if $R0 < 1$ then epidemic will die out; if $R0 > 1$ potential exists for an epidemic). Simulations, Uncertainty Quantification, and Model Calibration (Parameter Estimation), and Sensitivity Analysis (Latin hyper-cube sampling of $N$ [uniform] random points) were then performed to validate and analyze the model.

**DISCUSSION:** We found different degrees of influence made by parameters on the potential for the epidemic to spread. Rapid diagnosis of the disease decreased the $R0$ more than many other diseases parameters.

**CONCLUSION:** Rapid diagnostic methods to confirm MERS-CoV may lead to early quarantine, and or therapeutic interventions, and potentially halt an epidemic. The model may assist in informing and updating infection control policy.

**594. Prolonged use of novel meropenem-vaborbactam in carbapenem-resistant enterobacteriaceae: a case report** *Kathy Choi*, *Pharm.D. Candidate*, *BS*[1], Anh-Thu Truong, Pharm.D. Candidate, BS[1], Scott T. Hall, Pharm.D., BCPS[2], Leslie B. Robinson, MD[2], Vanthida Huang, Pharm.D., BSPHM, FCCP[1]; [1]Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ [2]HonorHealth John C. Lincoln Medical Center, Phoenix, AZ

**INTRODUCTION:** Treatment options are limited for Klebsiella pneumoniae (KP), the most prevalent among carbapenem-resistant Enterobacteriaceae (CRE). Meropenem-vaborbactam (M/V) is a novel carbapenem and beta-lactamase inhibitor combination targeted against CRE infections. Although meropenem shows poor penetration into the central nervous system (CNS), the potential use for M/V in CNS CRE KP infections remains unknown. Thus, we describe a patient case successfully treated with prolonged M/V for multidrug-resistant (MDR) KP ventriculitis.

**CASE:** A 29-year-old male, with past medical history of traumatic brain injury status post motor vehicle accident, presented with altered mental status and was admitted with suture site drainage from recent cranioplasty. Blood cultures (BC) were positive for CRE KP, only susceptible to gentamicin and tigecycline. He received intravenous (IV) gentamicin and tigecycline empirically for 2 days. Susceptibility result was resistant to ceftolozane-tazobactam while ceftazidime-avibactam testing was unavailable, secondary to test product shortage. He was switched to M/V 4g IV every 8 hours plus intrathecal gentamicin 8 mg daily for ventriculitis. M/V was scheduled for a total duration of 6 weeks and was received for a total of 45 days. Patient developed leukopenia after 11 days of M/V treatment, and chest rash with unknown origin on day 32. He also underwent multiple procedures including ventriculostomy on hospital day 2, and ventriculoperitoneal shunt (VPS) surgery due to hydrocephalus on hospital day 26. Patient was discharged with negative cerebrospinal fluid cultures and clinical resolution of ventriculitis due to VPS infection after 48 days of hospitalization.

**DISCUSSION:** This case reveals M/V as a potential treatment for clearance of CRE KP, especially in CNS infections such as ventriculitis. M/V may be a promising addition to the limited arsenal against CNS infections due to CRE KP.

**CONCLUSION:** In this era of rising MDR organisms, M/V is great addition to our armamentarium in the treatment of CNS infections.

**595. Lactobacillus bacteremia following a single dose of a probiotic containing *Lactobacillus rhamnosus* GG: a case report** Gary Burdge, Pharm.D.[1], *Steven Smoke*, *Pharm.D.*, *BCPS*[2], Maria DeVivo, Pharm.D., MPA, BCPS, BCACP[2]; [1]Pharmacy, RWJBarnabas Health Behavioral Health Center, Toms River, NJ [2]Pharmacy, Jersey City Medical Center, Jersey City, NJ

**INTRODUCTION:** Use of probiotics containing *Lactobacillus* species has been linked to bacteremia. Risk factors include the presence of a central venous catheter (CVC), immunosuppression, prior surgical intervention and prolonged hospitalization. This case details a post-cardiothoracic surgical patient who developed *Lactobacillus* bacteremia after a single dose of a probiotic containing *Lactobacillus rhamnosus* GG.

**CASE:** An 83-year old Guyanese woman was admitted with a chief complaint of chest pain. She was diagnosed with an NSTEMI and underwent a coronary artery bypass graft. Post-operatively she developed acute respiratory failure. She received two courses of antibiotics for possible pneumonia. After several failed extubations she underwent tracheostomy on day 24. On day 25, the patient was started on *Lactobacillus rhamnosus* GG, administered through a percutaneous endoscopic gastrostomy tube. At that time, she had a CVC. Several hours later after placement of a peripherally inserted central catheter, the patient became hypotensive requiring vasopressors and developed leukocytosis. Blood cultures were collected and she was maintained on her current antibiotic therapy at the time, meropenem. Blood culture results eventually revealed *Lactobacillus* species growing in both cultures. The probiotic was promptly discontinued. The patient received meropenem and vancomycin for the duration of her hospitalization. She was discharged on day 39 to an extended care facility to complete a total of 21 days of therapy.

**DISCUSSION:** Unlike previously published cases, the patient developed bacteremia after a single dose of probiotic. The speciation of the *Lactobacillus* that grew was not available; therefore causation cannot be directly linked to the probiotic. It is speculated that the probiotic capsule may have been opened during administration and the presence of a CVC may have contributed to the subsequent bacteremia.

**CONCLUSION:** Clinicians should be aware of the risk of bacteremia with probiotic use. Caution should be exercised opening probiotic capsules during administration, particularly for patients with CVCs.

**596. Brucella bacteremia misidentified as an ochrobactrum anthropi infection** *Kyle C. Molina, Pharm.D.*[1], Leslie B. Robinson, MD[1], Vanthida Huang, Pharm.D., BSPHM, FCCP[2]; [1]HonorHealth John C. Lincoln Medical Center, Phoenix, AZ [2]Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ

**INTRODUCTION:** Brucellosis due to *Brucella species*, gram-negative facultative intracellular coccobacilli is associated with < 200 cases in humans annually in the U.S. Brucella is transmitted from animals to humans by ingestion of contaminated food products, direct contact with infected animals, or inhalation of aerosols. *Ochrobactrum spp. is genotypically similar to Brucella therefore are misidentified with many diagnostic systems. Herein, we describe a case of Brucella bacteremia misidentified as Ochrobactrum anthropi*.

**CASE:** A 67-year-old female presented to the ED with month-long complaints of intermittent fever/fatigue. She reported recent travel to Saudi Arabia/Africa. Initial blood cultures (BCs) revealed gram-negative rods, she was initiated on piperacillin-tazobactam 3.375g every 8 hours. Two days after initial results, *Ochrobactrumn anthropi* was identified. Follow-up cultures showed persistent bacteremia with five sets of positive BCs for 14 days. Day 19, elevated Brucella IgM was detected by outside Laboratory. Exhaustive history revealed she consumed raw camel milk while in Africa. The *Brucella spp*. confirmed by the State of Arizona, she was initiated on ciprofloxacin 400 mg IV every 12 hours. The patient was discharged on ciprofloxacin 500 mg PO BID, doxycycline 100 mg PO BID, and rifampin 300 mg PO BID with microbiologic cure at hospital day 33.

**DISCUSSION:** Brucellosis is rare; however, differential diagnoses should include *Brucella spp*. in patients with recent travel to endemic areas including Kenya/India/Saudi Arabia who have consumed camel milk. This case reinforces the need for thorough patient histories and understanding pathogens likely to be misidentified. Pathogen misidentification should be considered with a positive *Ochrobactrum anthropi* using rapid diagnostics. *Brucella* serologies should be triggered with identification of *Ochrobactrum spp*.

**CONCLUSION:** Brucellosis is rare in the U.S. Proper algorithms are needed to prevent misidentification and treatment delays. This case demonstrates the difficulties of initial identification of *Brucella spp*. and ensuing delays in appropriate therapy.

## NEUROLOGY

**597E. Symptomatic intracerebral hemorrhage after thrombolysis with TPA in minor stroke: a case report** *Ahmed Zaki, Pharm.D. Candidate*[1], Jessica L. Johnson, Pharm.D., BCPS[2]; [1]College of Pharmacy, Xavier University of Lousiana, New Orleans, LA [2]William Carey University School of Pharmacy, Biloxi, MS

Presented at ASHP, Las Vegas, NV, December, 2016.

## PSYCHIATRY

**598. Persistent aripiprazole-induced akathisia post-discontinuation: a case report** *Eric Tobin, Pharm.D. Candidate*, Catherine Derington, Pharm.D. and Benjamin Chavez, Pharm.D.; Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

**INTRODUCTION:** Aripiprazole, asenapine, and lurasidone are known to have a higher risk of akathisia compared to other second-generation antipsychotic(SGAs). Relatively, aripiprazole has a high incidence (up to 25%) of akathisia when treating non-schizophrenia illnesses. Duration and persistence of akathisia symptoms post-discontinuation is not well-described.

**CASE:** A 47-year-old white female with a medical history of brain injury, migraines, and major depressive disorder (MDD) presented with ongoing depression symptoms, including lack of motivation and energy. She was started on aripiprazole 5mg daily to augment escitalopram 20mg and bupropion 300mg XL. Five weeks after initiation the patient reported improvement in depression symptoms but was experiencing akathisia Consequently, her dose was decreased to 2.5 mg daily. One week later, aripiprazole was discontinued due to persistent akathisia symptoms. During this time, no other medication, diet, or lifestyle changes were made. Two weeks after discontinuation, the patient reported less severe, but persistent, akathisia extending beyond the expected wash-out period of 15 days based on the elimination half-life. Her symptoms were accompanied by worsened

depression symptoms. Propranolol 10mg x 3 days temporarily relieved the akathisia. At week 6 follow-up, akathisia continues to improve.

**DISCUSSION:** A PubMed search on akathisia symptoms specific to aripiprazole yielded no information on a temporal relationship between akathisia duration or persistence post-aripiprazole discontinuation. The Naranjo Adverse Event Probability Scale classified this event as "probable." Given the variability in receptor type and affinity of the SGAs, further research is needed to characterize the incidence, severity, and duration of post-discontinuation extrapyramidal symptoms (EPS) for aripiprazole versus other second-generation antipsychotics.

**CONCLUSION:** In summary, this case describes EPS persisting 3 weeks after discontinuation aripiprazole. Further research is needed on antipsychotic use in MDD to fully evaluate their incidence, severity, and duration of EPS. Research into causes and characterization of post-discontinuation EPS may be warranted.

## PULMONARY

**599. Transition of oral selexipag to parenteral prostacyclin in patient with eisenmenger's syndrome case report** *Ranran Xia, Pharm.D.*[1], Ashrith Guha, MD, MPH, FACC[2], Kevin Donahue, Pharm.D.[1]; [1]Department of Pharmacy, Houston Methodist Hospital, Houston, TX [2]Houston Methodist Debakey Heart & Vascular Center, Houston Methodist Hospital, Houston, TX

**INTRODUCTION:** Selexipag is an oral prostacyclin analog that is a selective prostacyclin $IP_2$ receptor agonist. Its stability and long half-life combined with oral administration make this an appealing agent in the treatment of pulmonary arterial hypertension (PAH). However, evidence is limited on the transition from selexipag to intravenous (IV) prostacyclin analogs in PAH disease progression.

**CASE:** A 51 year old female with right to left shunt secondary to large unrepaired atrial septal defect with Eisenmenger's physiology and severe PAH presented with shortness of breath and lower extremity edema. A right heart catherization revealed elevated PAP 125/30mmHg, with oxygen saturations of 60-70% despite increasing support. Her PAH regimen at admission included macitentan, selexipag, and riociguat.

Due to continued hemodynamic deterioration, she was transitioned to IV epoprostenol using a conservative cross titration regimen. Epoprostenol was started at 1ng/kg/min and increased at a rate of 1ng/kg/min per day until 13ng/kg/min. Selexipag was down titrated at 200-400 mcg per day and was discontinued by day 4. The patient did not experience any significant side effects or hemodynamic instability during the cross titration process, and her oxygen saturation improved to 80-90%.

**DISCUSSION:** To our knowledge, this is the first case describing succesful transitioning from selexipag to parenteral prostacyclin in an Eisenmenger's Syndrome patient. Intravenous epoprostenol can be rapidly up-titrated to tolerability, with no theoretical maximum dose. The usual up-titration for selexipag is 200 mcg twice daily at weekly intervals. Yet, no recommendation exists on the tapering of selexipag. In a post hoc analysis evaluating the consequences of selexipag treatment interruption, there was a low rate of adverse events reported and no acute deterioration occurred within 14 days. This is likely due to the longer half-life of selexipag's active metabolite compared to that of parenteral prostacyclins.

**CONCLUSION:** Selexipag could potentially be discontinued early on during cross titration with minimum complications.

## SUBSTANCE ABUSE/TOXICOLOGY

**600. Loperamide associated opioid use disorder and treatment by buprenorphine taper** *Stephanie Nichols, Pharm.D., BCPS, BCPP*[1], Lee Wolfrum, MD[2], Chris Racine, MD[2], Aimee Nordmeyer, Pharm.D.[2]; [1]School of Pharmacy, Husson University, Bangor, ME [2]Maine Medical Center, Portland, ME

**INTRODUCTION:** This report describes a case of a patient with opioid use disorder who developed cardiac toxicity secondary to use of loperamide as a replacement for illicit opioids. Since loperamide is a P-glycoprotein substrate, high dose loperamide causes CNS opioid agonism, whereas low dose loperamide remains peripherally and is used to treat diarrhea. Complications of non-medical loperamide use have been documented, including cardiotoxicity and death. This is particularly important in light of the ongoing opioid epidemic.

**CASE:** Subsequent to cessation of prescribed oxycodone 120mg daily, this patient began taking non-prescribed oxycodone, heroin, and ultimately, 200mg of oral loperamide daily. She presented to the ED with a QTc of 649msec and normal electrolytes. Thus, she was admitted to a telemetry unit for close monitoring. Abrupt cessation of her high dose loperamide therapy resulted in opioid withdrawal symptoms, which were successfully treated with a buprenorphine taper.

**DISCUSSION:** Methadone doses above 45mg daily are associated with QTc prolongation. Buprenorphine was selected to avoid administering further QTc prolonging medications such as methadone. Buprenorphine is legally permitted for inpatient administration since this patient was admitted for medical reasons (QTc prolongation). Given the significant risk of cardiac toxicity and current ease of OTC acquisition, consideration should be given to placing loperamide behind the pharmacy counter and restricting its sale to only by a licensed pharmacist, in a manner similar to current pseudoephedrine laws.

**CONCLUSION:** Because it can result in marked and life threatening toxicity, non-medical use of loperamide requires increased recognition by the entire healthcare community, including both physicians and pharmacists. Loperamide-associated opioid use disorder and withdrawal can be successfully and safely treated with buprenorphine.

**601. I smell a rat: coagulopathy after exposure to brodifacoum contaminated synthetic cannabinoid** Renee Petzel Gimbar, Pharm.D.[1], Margaret Choye, Pharm.D., BCPS[2], Michael Koronkowski, Pharm.D.[3], Christina McKnight, Pharm.D.[4], Jason Devgun, MD[5], Arkady Rasin, MD[5], Timothy Meehan, MD, MPH[6], Trevonne Thompson, MD[6], *Jennie Jarrett, Pharm.D., BCPS, MMedEd*[7]; [1]Department of Pharmacy

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**INTRODUCTION:** Synthetic cannabinoids are illicit substances with psychoactive effects, and when contaminated with brodifacoum, additional dangerous anticoagulant effects. A recent outbreak of contaminated synthetic cannabinoids occurred in the metropolitan Chicago area over March/April 2018.

**CASE:** Three cases presented to the University Of Illinois Hospital Emergency Department complaining of bleeding after smoking synthetic cannabinoids multiple times daily. First, a 33-year old Hispanic male presented with hematuria and blood from his rectum, with labs including: hemoglobin (Hgb) 14.2 g/dL, dropping to 9.7 g/dL over 10 hours, and unmeasurable INR. Patient received phytonidione 10mg, cryoprecipitate 10 units, and fresh frozen plasma (FFP) 4 units all intravenously (IV). He was titrated from phytonidione 50mg by mouth (PO) three times daily (TID) to once daily with outpatient titration to 40mg daily. Next, a 26-year old black female presented with excessive bleeding from her mouth and heavy menstruation. Labs demonstrated a Hgb 14.2 g/dL, dropping to 12.2 g/dL over 12 hours, and unmeasurable INR. She received phytonidione 10mg IV and FFP 2 units IV, started on phytonidione 50mg PO TID and titrated to 50mg twice daily (BID) at discharge with outpatient titration to 25mg daily. Finally, a 25-year old black male presented with hematuria and an initial Hgb of 16.4 g/dL and INR unmeasurable for which he received phytonidione 10mg IV only. He was started on phytonidione 50mg PO TID and titrated to 50mg BID at discharge with outpatient titration to 25mg BID. All outpatient INRs were <2, however all patients were lost to follow-up between 30-75 days.

**DISCUSSION:** Contaminated synthetic cannabinoid use has occurred across multiple states, leading to multiple patient deaths. Clinical pharmacist's involvement is critical for initial and ongoing treatment management with high dose phytonidione.

**CONCLUSION:** Treatment of coagulopathy associated with contaminated synthetic cannabinoid use is individualized, consisting of high dose oral phytonidione and long-term follow-up.

## TRANSPLANT/IMMUNOLOGY

**602. Cross-reactive allergy between polyethylene glycol and intravenous phytonadione in a liver transplant candidate.** Timothy Horwedel, Pharm.D., BCPS, Jennifer Hagopian, Pharm.D., BCPS, *Clarice Carthon, Pharm.D., BCPS*; Barnes-Jewish Hospital, St. Louis, MO

**INTRODUCTION:** Polyethylene glycol (PEG) is a commonly utilized pharmaceutical agent, including use as a laxative, PEG 3350. Reactions to this agent are rare. More commonly reported are reactions to IV phytonadione. We present a patient with allergic reaction to phytonadione and PEG spurred by reactivity against the C-C-O backbone in polymers.

**CASE:** The patient is a 52 year-old Hispanic female with a history of primary sclerosing cholangitis under evaluation for liver transplant. She reported no medication allergies. As part of her evaluation, colonoscopy was scheduled and a PEG3350 preparation was ordered. The patient presented to the emergency room 30 minutes after administration with hypotension and erythema, which resolved with discontinuation, methylprednisolone and diphenhydramine. She was noted to have an elevation in her INR (2.4) for which phytonadione IV 10 mg was given. Within 10 minutes, the patient developed an anaphylactoid reaction requiring treatment. The transplant pharmacist was consulted to investigate the two uncommon and seemingly unrelated reactions. Of interest, the patient was discharged and experienced a similar reaction to a soy-based drink containing acacia gum.

**DISCUSSION:** Allergies to the IV phytonadione have been documented, although with a low frequency (3 cases per 10,000 doses). The incidence of PEG allergy is poorly understood, however these appear to be mechanistically linked. Phytonadione contains polyoxyethylated fatty acids, and this is known to cause anaphylactoid IgG or IgM mediated reactions. Researchers have noted that these IgG and IgM antibodies target the C-C-O backbone and react to polymers commonly used in drugs and foods. The three products eliciting a response in the patient were emulsifying agents with a C-C-O backbone.

**CONCLUSION:** Allergy to Phytonadione and PEG are likely driven by antibodies against the C-C-O backbone in polymers used in pharmacological products. Understanding of the cross-reactivity with other drugs by pharmacists may prevent substantial harm to patients.