





An opinion paper of the Cardiology Practice and Research Network of the American College of Clinical Pharmacy: Recommendations for training of cardiovascular pharmacy specialists in postgraduate year 2 residency programs

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Abstract

Pharmacists in direct patient care settings are expanding their roles and responsibilities. These changes mandate a deeper and broader understanding of disease states, as well as influencing social, behavioral, and environmental factors. Existing guidelines and accreditation standards related to the training of graduate or cardiovascular pharmacist specialists (ie, Accreditation Council for Graduate Medical Education, American Society of Health-System Pharmacists, American College of Clinical Pharmacy [ACCP]) provide some guidance on essential competencies. However, they stop short of providing recommendations for how to achieve all the objectives. The purpose of this paper is to build upon existing guidelines/standards, describing our recommendations for pharmacy residency training of a cardiovascular clinical specialist. The paper is broken down into the following sections: (1) Skills and Competencies (Building Clinical Skills, Application of Clinical Knowledge and Skills, Drug Information, Research and Scholarship, Teaching Skills, Interpersonal, Communication, and Presentation Skills), (2) Personal and Professional Growth (Growing Interpersonal Skills, Engaging with the Profession), (3) Program Design (Resident Selection, Preceptors and Mentoring, Expectations for Progress/Milestones, Program and Learning Experience Structure), and (4) Clinical and Therapeutic Content Expertise or Medical Knowledge. After each recommendation, specific details are provided to aid in conceptualizing how each can be achieved. Some recommendations are considered essential whereas others are designated as optional. This paper represents the opinion of the Cardiology Practice and Research Network of the American College of

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KEYWORDS

cardiology, clinical pharmacist, pharmacy, residency, training activities

1 | INTRODUCTION

As the profession of pharmacy moves into the future, part of the challenge includes the changing landscape of clinical pharmacy. Pharmacists in direct patient care settings are expanding roles and responsibilities. No longer confined to dosing protocols and collaborative practice algorithms, pharmacists are assuming greater autonomy over drug therapy decisions and the requisite patient monitoring. However, with greater autonomy comes heightened responsibility and ownership over patient outcomes related to drug therapy. This requires a certain level of clinical knowledge, skills, and behaviors. It also emphasizes the need for more complete assessment skills and understanding of diagnostic evaluations.

Clinical pharmacy is also expanding beyond ambulatory and institutional practice, to disease state management outside of traditional settings (eg, transitional care, emergency department, and community medication therapy management).¹

The complexity of patient management also continues to evolve. These changes mandate a deeper and broader understanding of disease states, as well as influencing social, behavioral, and environmental factors. Acknowledging the complexity of healthcare, a team-based, patient-centered approach has been advocated.^{1,2} Therefore, interpersonal skills and the ability to provide education at varying levels, lay and professional, is an ever-expanding component of direct patient care.

To meet all these challenges, the training of clinical pharmacists must remain on the cutting-edge. Existing guidelines and accreditation standards related to the training of graduate or cardiovascular specialists (ie, Accreditation Council for Graduate Medical Education [ACGME], American Society of Health-System Pharmacists [ASHP], and American College of Clinical Pharmacy [ACCP]) provide some guidance on essential competencies. However, they stop short of providing recommendations for how to achieve all the objectives.

The Cardiology Practice and Research Network (PRN) chose to address this gap by developing such recommendations. The purpose of this paper is to serve as a companion piece to existing guidelines and accreditation standards by describing our recommendations for residency training of a cardiovascular clinical specialist. Participation in this initiative was offered to all members of the Cardiology PRN. Interested PRN members submitted their names, experiences with cardiology residencies, and cardiovascular practice site information; the writing group was selected by project leaders (TN, RD, and TR) to include those with diverse backgrounds and experiences.

Recommendations provided in this paper are classified as “strongly recommend [SR],” defined as a core activity for all cardiology

residency programs, or as “optional [O],” defined as an activity that should be included if available and does not interfere with core activities. Recommendations are all based on expert consensus. After each recommendation, specific details are provided to provide the rationale, and/or examples of how recommendations can be implemented to aid in conceptualizing how each can be achieved. Our hope is this document will not only serve as a complementary resource for institutions that already have postgraduate year 2 (PGY2) residency training programs, providing ideas for improvement or expansion, but also for sites interested in developing de novo programs. It may also be a useful resource for those who serve as preceptors or mentors. This paper represents the opinion of the Cardiology Practice and Research Network of the American College of Clinical Pharmacy. It does not necessarily represent an official ACCP commentary, guideline, or statement of policy or position.

2 | SKILLS AND COMPETENCIES

The cardiovascular clinical pharmacist must obtain and master a wide range of clinical knowledge, skills, and behaviors to provide optimal, evidence-based patient care. This section outlines those foundational skills that should be mastered prior to completion of formal training.

These foundational skills enable the cardiovascular clinical pharmacist to provide expert patient care with a particular focus on the safe and effective use of medications for the prevention and treatment of cardiovascular disease. This section also describes standards for scholarly activity, teaching, and professionalism.

2.1 | Recommendations regarding building clinical skills

2.1.1 | Recommendation

The resident should be able to apply appropriate medical terminology related to cardiovascular anatomy and physiology, in both written and oral communications. [SR]

Understanding of medical terminology is an essential skill for new practitioners.

2.1.2 | Recommendations

The resident should be able to conduct a targeted cardiovascular disease and medication history. [SR] The resident should be able to

perform a focused cardiovascular physical exam and interpret common abnormal physical exam findings. [SR]

In order to devise and implement the optimal treatment plan, an appropriate cardiovascular assessment is required. While the resident should not be expected to provide diagnostic expertise, he or she should be able to assess disease status and response to therapy with the goal of deducing optimal treatment decisions. Particular emphasis should be placed on obtaining a complete and accurate cardiovascular disease and medication history. A recent survey of postgraduate year 1 (PGY1) and PGY2 pharmacy residency programs revealed that 38% of programs require physical examination skills for one or more learning experiences.³ Therefore, the resident should be knowledgeable of the most common physical exam findings that relate to cardiovascular disease and be capable of performing a focused cardiovascular physical exam to assess for these findings (ie, lower extremity edema, jugular vein distention, irregular vs regular rhythm, murmurs, rubs, gallops, crackles/rales, etc.).

2.1.3 | Recommendations

The resident should be able to provide basic interpretation of a 12-lead surface electrocardiogram. [SR] The resident should be able to describe the most commonly used diagnostic tests and interpret a test report. [SR]

Familiarity with common tests used for the diagnosis of cardiovascular disease is a foundational skill for practitioners. Basic interpretation of an electrocardiogram should include the ability to assess heart rate, common abnormal rhythms, hypertrophy, ischemic changes, QT-interval interpretation, and possibly changes specific to common conditions such as electrolyte abnormalities. Knowledge of diagnostic tests will lead to a deeper level of engagement in patient care and understanding of the overall management plan. This includes an understanding and interpretation of diagnostic tests commonly used in cardiology. (Table 1)

2.1.4 | Recommendation

The resident should be versed in the interpretation of laboratory results in general and specific to cardiovascular medicine. [SR] The resident may gain familiarity with laboratory biomarkers that remain investigational for clinical application to cardiovascular diseases. [O] The resident should be versed in the indications, requirements, and interpretation of cardiovascular medications that require or utilize therapeutic drug monitoring. [SR]

A variety of laboratory tests is used to diagnose cardiovascular disease and evaluate therapy. As with diagnostic tests, basic understanding and interpretation of laboratory tests commonly used in cardiology (Table 1) is important in achieving greater depth and understanding of the overall management plan. Cardiovascular specialists, including residents, may also be exposed to emerging laboratory tests (eg, galectin-3, soluble ST2 [sST2], high-sensitivity cardiac troponin [hs-cTn]) in cardiology. Clinical pharmacists have a unique understanding of the pharmacokinetics

and pharmacodynamics of medications that require therapeutic drug monitoring (eg, lidocaine, procainamide, and digoxin). Clinical interpretation of drug levels can play a significant role in optimizing treatment success.

2.1.5 | Recommendations

The resident should be able to explain, interpret, and apply principles of cardiovascular hemodynamics, including those obtained through a central line or invasive device (eg, intra-aortic balloon pump, Swan-Ganz catheter, or during cardiac catheterization). [SR] The resident should have a working knowledge of ventricular assist devices (VADs) and their impact on cardiovascular hemodynamics [SR] and may gain experience applying these principles in a direct patient care experience. [O]

An understanding of basic physiology and hemodynamics will assist in the selection and management of cardiovascular pharmacotherapies. Being able to discuss these tools using language and terminology appropriate for the interprofessional team is also important for building credibility within the team. Since all training sites may not provide advanced heart failure services (eg, percutaneous and durable VADs), a basic understanding of how these devices affect cardiovascular hemodynamics is necessary but direct patient care experience may not be practical (Table 2).

TABLE 1 Diagnostic and laboratory tests for which cardiovascular trainees should demonstrate competence

Diagnostic tests	Laboratory tests
<ul style="list-style-type: none"> • Electrocardiogram (ECG) • Chest radiograph • Echocardiogram <ul style="list-style-type: none"> ◦ Transthoracic echocardiogram (TTE) ◦ Transesophageal echocardiogram (TEE) • Stress testing <ul style="list-style-type: none"> ◦ Exercise stress testing ◦ Pharmacological stress testing • Cardiac catheterization <ul style="list-style-type: none"> ◦ Right heart catheterization ◦ Left heart catheterization ◦ Coronary angiogram • Cardiopulmonary exercise testing • Cardiac magnetic resonance imaging (MRI) • Cardiac computed tomography (CT) • Electrophysiology (EP) testing • Ankle-brachial index (ABI) 	<ul style="list-style-type: none"> • B-type natriuretic peptide (BNP) / NT-pro-BNP • Cardiac enzymes <ul style="list-style-type: none"> ◦ Cardiac troponin (cTn) <ul style="list-style-type: none"> • Troponin I (TnI) or T (TnT) ◦ Creatinine kinase-MB fraction (CK-MB) • Lipid panel <ul style="list-style-type: none"> ◦ Total cholesterol ◦ Low-density lipoprotein cholesterol (LDL-C) ◦ High-density lipoprotein cholesterol (HDL-C) ◦ Triglycerides • Advanced lipid studies <ul style="list-style-type: none"> ◦ Apolipoprotein B (Apo B) ◦ Lipoprotein A [Lp(a)] • Therapeutic drug monitoring <ul style="list-style-type: none"> ◦ Digoxin ◦ Amiodarone ◦ Lidocaine ◦ Procainamide • Pharmacogenomic testing <ul style="list-style-type: none"> ◦ CYP2C19 (eg, clopidogrel metabolism) ◦ SLCO1B1 (eg, statin-related myopathy risk) • hs C-reactive protein (CRP)

TABLE 2 Required and elective topics for PGY2 Cardiology residents

Topic areas	Required patient experience	Required case-based or topic discussion approach acceptable	Elective patient experience and/or case-based or topic discussion
Cardiovascular risk reduction	Dyslipidemias Hypertension		Women's health Smoking & substance abuse cessation Diabetes Risk reduction in patients with HIV/AIDS
Atherosclerotic disease	Atherosclerosis Acute coronary syndromes (STEMI/NSTEMI/UA) Cardiovascular testing (echocardiography, nuclear stress test, exercise and pharmacologic stress tests) Chronic coronary artery disease Percutaneous coronary intervention	Quality measures Peripheral arterial disease Cerebrovascular disease	
Dysrhythmias	Atrial arrhythmias Drug induced QT prolongation EKG monitoring Ventricular arrhythmias		Congenital QT prolongation
Heart failure	Acute decompensated heart failure Cardiogenic shock Cardiorenal syndrome Stable HFrEF/HFpEF Drug induced Cardiomyopathies	Cardiac transplantation Quality Measures	Cardiomyopathies Myocarditis Amyloidosis Sarcoidosis
Cardiothoracic surgery related	Coronary artery bypass graft surgery Aortic stenosis & aortic insufficiency (AVR) Mitral stenosis & mitral regurgitation (MVR) Endocarditis Aortic dissection	TAVR, TMVR ECMO	Congenital heart defects Atrial & ventricular septal defects Tetralogy of Fallot Coarctation Transposition of the great vessels Pericardial window Treatment of atrial fibrillation (Maze, Convergent)
Cardiac critical care	Advanced cardiac life support Hypertensive urgency & emergencies Vasopressors & inotropes	Hypothermia Intravascular hemodynamic monitoring devices (eg, Swan Ganz)	Sedation, analgesia, delirium Acid/Base disorders Palliative care
Anticoagulation & antiplatelet therapy	Prevention and treatment of thromboembolic disease (VTE, PE, stroke) Hemorrhagic complications Monitoring Thrombolytics Heparin-induced thrombocytopenia	Hemostasis	Hypercoagulable states Cancer Pregnancy Disseminated intravascular coagulation
Devices	Intra-aortic balloon pump Pacemakers CRT ICD	Percutaneous left ventricular assist devices LAAO devices Temporary mechanical support devices Implantable monitoring devices Ventricular assist devices	
Other	Pulmonary hypertension Cardiovascular anatomy & physiology	Pericardial diseases Pericarditis & pericardial effusions	Cardiac tamponade Neonatal/pediatric cardiovascular diseases

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Abbreviations: AIDS, acquired immune deficiency syndrome; AVR, aortic valve replacement; CRT, cardiac resynchronization therapy; ECMO, extracorporeal membrane oxygenation; HIV, human immunodeficiency virus; ICD, implantable cardioverter defibrillator; LAAO, left atrial appendage occlusion; MVR, mitral valve replacement; NSTEMI, non-ST-elevation myocardial infarction; PE, pulmonary embolism; STEMI, ST-elevation myocardial infarction; TAVR, transcatheter aortic valve replacement; TMVR, transcatheter mitral valve replacement; UA, unstable angina; VTE, venous thromboembolism.

2.2 | Recommendations regarding application of clinical knowledge and skills

2.2.1 | Recommendations

The resident should be able to apply clinical pharmacology of agents used in the management of common acute and chronic cardiovascular diseases (refer to Table 2) to direct patient care. [SR] The resident should be able to apply nuances of cardiovascular drug therapy (eg, mechanisms for adverse drug reactions [ADRs] and clinical application of unique pharmacologic properties) [SR].

Clinical pharmacology considerations allow for optimization of therapy and minimization of ADRs. The resident should demonstrate appropriate knowledge of pharmacokinetic and pharmacodynamic considerations for cardiovascular drug therapy for the commonly encountered acute and chronic cardiovascular diseases. A list of cardiovascular topics, including the type of exposure, was developed by cardiology pharmacy practitioners, RPDs, and ASHP staff; approved by the ASHP Commission on Credentialing; and endorsed by the ASHP Board of Directors as part of the *Required Competency Areas, Goals, and Objectives for Postgraduate Year Two (PGY2) Cardiology Pharmacy Residencies*. (Table 2)

2.2.2 | Recommendations

The resident should collect and assess patient-specific data; develop an evidence-based, individualized pharmacotherapy plan (start, stop, continue, increase, and decrease) for patients with common cardiovascular diseases (refer to Table 2); implement the pharmacotherapy plan, which may require educating patients/caregivers and making referrals to other providers; and perform follow-up monitoring to evaluate efficacy, safety, and adherence. [SR] The resident should be able to justify the plan and discuss the advantages of the chosen (optimal) plan over other potential (alternative) plans. [SR] The resident may gain familiarity with indications for nonpharmacologic cardiovascular interventions (eg, procedures) and treatment and may participate in decisions with the cardiovascular team regarding advantages/disadvantages of pharmacotherapy vs non-pharmacotherapy interventions. [O]

The Pharmacists' Patient Care Process outlines an approach for pharmacists to provide patient-centered care. This process requires pharmacists to collect and assess patient-specific data, develop and implement the pharmacotherapy plan, and perform follow-up monitoring to evaluate efficacy, safety, and adherence.⁴ A comprehensive pharmacotherapy plan should include evidence-based, individualized recommendations for therapy initiation and dosing schedule, therapy monitoring and adjustment, duration of treatment, and patient/provider counseling (when applicable). In situations without a broad evidence base, the resident should demonstrate appropriate clinical reasoning to determine the preferred treatment plan on a patient-by-patient basis. This plan may be conveyed in writing or verbally as appropriate for the situation.

2.3 | Recommendations regarding drug information

2.3.1 | Recommendations

The resident should demonstrate proficiency in the retrieval, interpretation, and formulation of accurate drug information. [SR] The resident should demonstrate proficiency in the knowledge of and ability to navigate cardiovascular-specific resources (eg, textbooks, journals, smartphone apps used for risk stratification, or cardiovascular calculations) and be able to discriminate the quality of information from various sources. [SR] The resident should demonstrate competence with critical evaluation of primary, secondary, and tertiary literature. [SR] The resident should be competent and timely in addressing complex cardiovascular pharmacotherapy questions accurately and comprehensively, including the identification of clinical scenarios in which the primary literature do not apply. [SR]

2.3.2 | Recommendations

The resident should be fluent in the consensus guidelines utilized for the common acute and chronic cardiovascular diseases. [SR] The resident should be familiar with cardiovascular conditions that have multiple guidelines or consensus statements. [SR] The resident should identify clinical situations for which consensus guidelines do not apply. [SR]

The resident should be familiar with important guideline recommendations related to the pharmacotherapy of cardiovascular disease. Deep knowledge of guidelines and interguideline differences will continue to be developed throughout one's career. A foundational understanding of the basic mechanisms of cardiovascular disease is required for the cardiovascular clinical pharmacist to understand the basis for cardiovascular pharmacotherapies. Pertinent guidelines include those related to hypertension, dyslipidemia, stable coronary artery disease (CAD), non-ST-segment elevation acute coronary system (NSTEMI-ACS), ST-segment elevation myocardial infarction (STEMI), percutaneous coronary intervention (PCI), dual antiplatelet therapy (DAPT), atrial fibrillation (AF), heart failure (HF), supraventricular tachyarrhythmias (SVT), ventricular arrhythmias, anticoagulation, etc.

2.4 | Recommendations regarding research and scholarship

2.4.1 | Recommendations

The resident should be able to identify and refine a relevant question related to cardiovascular patient care/practice and design a project (original research or quality improvement) to address the question. [SR] The resident should demonstrate leadership, responsibility, and accountability for the research project progress (eg, data collection and engagement of research team members).[SR] The resident should assume responsibility for regulatory management of the project (eg, institutional review board [IRB] approval and study closure, if applicable, proper data security/confidentiality).[SR] The resident should prepare a formal/professional manuscript in a format

consistent with peer-reviewed publication. [SR] The resident should demonstrate ability to provide a fair, edifying, and accurate peer review of an article being considered for publication. [SR]

Clinical pharmacists are uniquely positioned to contribute to the available medical knowledge in a variety of domains ranging from medication use evaluations to clinical trials and basic biomedical research. The importance of obtaining scholarly skills during residency training should be a function of the resident's interest in pursuing an academic career. However, skills related to scholarship may directly enhance the clinical skills of the resident, especially in the application of evidence-based medicine. The ability to interpret design and results of clinical trials, observational studies (especially registries), meta-analysis, and conduct practice-based research, are all helpful in clinical decision-making for individual patients. Though it is recognized that the resident will need assistance from more experienced writers on his/her team, the resident is expected to lead the manuscript development, and to complete the majority of a writing project. Due to time constraints of a residency program, mastery of clinical skills maintains priority over development of scholarly or research skills. However, developing and leading all aspects of a research or quality improvement product, including preparation of a manuscript summarizing the observations, and performing a peer review of a manuscript being considered for publication are foundational skills for cardiovascular clinical pharmacists. Programs may integrate other activities related to scholarship and academic development if desired.

2.5 | Recommendations regarding teaching skills

2.5.1 | Recommendations

The resident should be able to identify knowledge/skill deficits in patients and/or healthcare team members for which educational content can be directed. [SR] The resident should be skillful in providing pharmacotherapy-based education to patients, caregivers, the healthcare team, and/or staff supporting the healthcare team (eg, care coordinators, and social work) in a practice environment. [SR] The resident should be able to effectively teach (see Section 2.6) cardiovascular pharmacotherapy and adapt the content/presentation style to various audience groups and sizes (eg, students, nurses, fellows, and pharmacists). [SR]

As the medication expert, the clinical pharmacist should be able to provide education (reflecting the disease states in Table 2) to all those involved in patient care, including the patient and caregivers. The depth, breadth, and delivery of any educational session should be appropriate for the audience. Education may be provided in all environments from the bedside to the classroom. Additionally, it may be formal (eg, didactic lecture) or informal (eg, during patient rounds).

2.5.2 | Recommendations

The resident should be able to identify knowledge/skill deficits in experiential trainees for which educational content can be directed. [SR] The resident should be skillful in employing appropriate

preceptor roles (eg, instruct, model, coach, and facilitate) when engaged in experiential training. [mandatory] The resident may gain experience with planning, executing, and assessing a learning experience with cardiovascular pharmacotherapy (didactic or experiential). [O] The latter would be highly desirable in those settings where such an opportunity exists.

Engagement of the next generation of healthcare providers is an important role for clinical pharmacists, especially in an academic setting. If available, experience providing education, mentorship, and guidance to students and/or PGY1 residents would enhance the residency experience and broaden the skillset of the cardiovascular pharmacy resident. Consideration should be given to having the resident serve as primary preceptor for a student rotation block if possible.

2.6 | Recommendations regarding interpersonal, communication, and presentation skills

2.6.1 | Recommendations

The resident should display the utmost professional presentation and behavior in all areas of professional life (physical appearance, nonverbal body language and facial expressions, and tone of voice/written communication). [SR] The resident should be able to communicate effectively, verbally and in writing, with various healthcare team members, including healthcare team members in training, in a way that respects the unique contribution of each team member. [SR] The resident should apply understanding and value of the various roles of the interprofessional healthcare team. [SR] The resident should be able to present and receive differing opinions in a collegial, respectful, and productive manner. [SR]

The practice of clinical pharmacy embodies and relies upon professionalism. Both colleagues and patients expect the highest standards of professionalism from pharmacists, who remain one of the most trusted professionals in the eyes of the public. Unprofessional behavior can interfere with patient care and undermine important contributions of the clinical pharmacist to patient care.

2.6.2 | Recommendations

The resident should be able to develop and deliver a presentation (handouts and/or audiovisual aids such as PowerPoint) on cardiovascular pharmacotherapy independently. [SR] The resident should be able to adapt scholarly presentations to the target audience appropriately (eg, clinicians, healthcare professionals in training, and patients). [SR]

An effective presentation must be tailored to the target audience. Patient education should be presented at the appropriate educational level. A professional presentation should include goals and objectives, citation of appropriate references, and possibly self-assessment questions, especially when providing continuing education.

3 | PERSONAL AND PROFESSIONAL GROWTH

All pharmacists have a formal requirement for professional development in the structure of continuing education. Specific requirements vary by state/country and are often increased by those with added credentials requiring specific training. This differs, however, from establishment of the practice of ongoing personal and professional development, which can and should be introduced during residency training. Learning how to refine interpersonal skills by advancing communication avenues, grow professionally by developing a strategy for life-long learning, and engage with the profession (eg, professional organization involvement), though not necessarily cardiovascular specific, are ultimately fundamental to the success of the cardiovascular pharmacist.

3.1 | Recommendations regarding growing interpersonal skills

3.1.1 | Recommendations

The ability of the resident to communicate effectively with patients and/or caregivers, allied health professionals, physicians, and other learners (eg, students and residents) in real-world (or virtual such as in telehealth) practice settings should be assessed (see ASHP PGY2 standards).⁵ [SR] Formal opportunities to develop communication skills should be afforded to residents (eg, written activities and presentations). [SR]

The most effective clinical pharmacist has strong interpersonal skills. Vital interpersonal skills include verbal and nonverbal communication, active listening, manners and professionalism, social awareness, self-management, responsibility, accountability, and assertiveness. Some of these skills can be learned (manners, listening, and verbal/nonverbal communication), but some of these skills are inherent and not specifically or easily learned (social awareness and emotional intelligence). As such, it is suggested to also evaluate residency candidates' interpersonal skills during the application and interview process.

Development of interpersonal skills is somewhat of a natural evolution and maturation progresses during pharmacy education and postgraduate training. As the resident moves through the PGY2 year, their confidence should progress from interacting with peer medical residents to engaging with more senior-level providers (eg, Cardiology fellows and attending physicians).

3.1.2 | Recommendations

Professional development may include training on modeling and coaching techniques to enhance resident communication. [O] When available and appropriate, the resident may be encouraged to attend scientific conferences to observe different methods/styles of communication by scientific leaders. [O] The resident may be encouraged to attend symposia and continuing education programs related

to communication (eg, developing new clinical service, scientific manuscript writing, grant writing, teaching, and social media). [O]

Facilitation of this process requires the focus of the programs preceptors and their appropriate application of the four preceptor roles: direct observation, modeling, coaching, and facilitating. For example, formalized modeling and coaching related to communication is very important. Residents must recognize that this is part of their training and providing direct and timely feedback specific to their interpersonal skills will help the resident hone their own skills. Miscommunications may not only limit a pharmacist's effectiveness and irreparably damage professional relationships but also can also have deadly consequences in healthcare. This area is further complicated in an age where electronic communication must also be addressed. Developing an understanding on appropriate times for written vs verbal communication, social media responsibilities, confidentiality and medical-legal communication, and how to develop appropriate patient-provider relationships is crucial.

3.1.3 | Recommendations

The resident should conduct ongoing informal and periodic formal self-assessments of performance for all learning goals and objectives. [SR] Formal self-assessments should be documented in a structured fashion using either written or computerized records. [SR] Ongoing informal self-assessment should involve the resident and preceptors, with the latter providing regular feedback on both strengths and weaknesses noted. [SR] The resident may be encouraged to submit written self-reflections after completion of any major formal activities (eg, didactic teaching, serving as preceptor for students, and grand rounds presentation). [O]

Beyond formalized training, professional success requires self-assessment. Paramount to refinement of self-assessment skills is providing residents with feedback throughout residency training while progressively challenging them to self-identify these areas for improvement.⁶⁻¹⁰ Through the Residency Program Design and Conduct, the focus in the PGY2 year is to learn how to identify weaknesses and, almost more vital, to make specific, attainable, and measurable goals to make progress on overcoming them.

3.2 | Recommendations regarding engaging with the profession

3.2.1 | Recommendations

Depending on resident interest, the resident should be encouraged to join and be an active member of local and/or national organizations related to cardiovascular medicine or clinical science. [O] The resident should be supported (eg, time and stipend) to attend at least one national scientific and/or educational meeting in clinical pharmacy and/or cardiology. [SR]

Engagement in local, state, regional, and national professional organizations can contribute to job satisfaction and professional growth. Identifying active roles and prioritizing opportunities to

TABLE 3 Specialty organizations in which cardiovascular pharmacists are commonly engaged

Organization	Committees that include pharmacists as members or in leadership roles	Websites ^a
American Heart Association (AHA)	<ul style="list-style-type: none"> · CLCD Clinical Pharmacology Committee · CLCD & GPM Cardio-Oncology Subcommittee · CLCD Leadership Committee · CLCD Scientific & Clinical Education Lifelong Learning Committee · QCOR Leadership Committee 	https://www.heart.org
American College of Cardiology (ACC)	<ul style="list-style-type: none"> · Academic Cardiology Section · Cardiovascular Team Section · Cardiovascular Training Section · Electrophysiology Section · Geriatric Cardiology Section · Surgeon's Section 	https://www.acc.org https://memberhub.acc.org/home
Heart Failure Society of America (HFSA)	<ul style="list-style-type: none"> · Board of Directors · Annual Scientific Meeting Program Committee · Lifetime Achievement Committee · Membership Committee · Patient Initiative Task Force 	https://www.hfsa.org
The International Society of Heart & Lung Transplantation (ISHLT)	<ul style="list-style-type: none"> · Annual Meeting Program Committee · Governance Committee · Standards and Guidelines Committee 	https://ishlt.org
Society of Critical Care Medicine (SCCM)	<ul style="list-style-type: none"> · Council · Clinical Pharmacy and Pharmacology Section · Emergency Medicine Section · Osteopathic Medicine Section · Research Section 	https://sccm.org/Home
National Lipid Association (NLA)	<ul style="list-style-type: none"> · Officers · Board members · Health Quality and Research Committee · Interprofessional Continuing Education Committee · Scientific Meetings Committee · Core Curriculum Committee · Membership Recruitment and Retention Committee · Membership Services Committee · Social Media Committee · Publications Committee · Practice Tools and Clinical Care Committee · Therapeutics Committee 	https://www.lipid.org

Note: This table is meant to represent a sample of specialty organizations in which pharmacists are frequently engaged. Cardiovascular pharmacists engage with and have leadership roles within several cardiovascular specialty organizations, including some that may not be listed.

Abbreviations: CLCD, Council on Clinical Cardiology; QCOR, Council on Quality of Care and Outcomes Research.

^aOrganizational leadership that included pharmacists and was available on the linked websites as of April 30, 2019. Each leadership activity listed contains a hyperlink to the organization's website as of April 30, 2019.

engage in the profession of pharmacy and the field of cardiology should be highlighted during training. In addition to continuing education obtained through meeting attendance, membership can provide opportunities to develop one's leadership skills by becoming actively involved and, depending on the organizational mission, serve an important role in advancing the profession and improving the health of patients on a broader level. Local, state, and even regional organizations provide a network of pharmacists that are familiar with the community culture. They can be important in mobilizing grass roots efforts, advancing practice involvement nearby, and providing a sense of community. These organizations can often provide more opportunities for the early career pharmacists to present and contribute. National organizations have advanced learning experiences

and networking opportunities and offer a large forum to drive national initiatives. Residents should be encouraged to explore pharmacy and cardiology organizations for further educational development and to utilize as a forum for employment opportunities postresidency training. There are often discounted rates for early career pharmacists or cardiology professionals and benefits to members often include, but are not limited to access to journals, newsletters, networking forums, career development resources, and research grants.

When approaching professional organizational involvement, like many aspects of training, it is important to recognize that past exposure to and engagement with professional organizations often differs among pharmacy residents, as do their personal goals and interests.

The resident should have an individualized development plan, which encourages exploration into serving the profession, leveraging the resident's strengths and interests. During the course of the year, the resident will ideally be able to attend at least one professional organization meeting, and we encourage this be approached as a learning experience. This mentored experience allows development of a professional approach to how to conduct oneself, networking, developing and practicing an "elevator" story, and capitalizing on these learning opportunities. This aspect of professional organization engagement should not be considered intuitive.¹¹ Table 3 provides examples of professional specialty organizations, in which pharmacists are included as members of committees and/or hold leadership positions.

4 | PROGRAM DESIGN

PGY2 residencies provide systematic education and training in advanced pharmacy practice and are designed to build and expand upon the knowledge and skills gained in a PGY1 program. The program should prepare the resident to successfully pass board certification. The learning experiences must be designed in a way that allow the resident to achieve the educational competency areas, goals, and objectives outlined for the PGY2 program in cardiology. There are five competency areas that need to be addressed in the PGY2 residency in cardiology. They are: (1) patient care, (2) advancing practice and improving patient care, (3) leadership and management, (4) teaching, education, and dissemination of knowledge, and (5) managing cardiovascular medical emergencies.⁵

Cardiovascular disease affects large numbers of men and women, becoming more common as people age. Patients with cardiovascular disease often have numerous comorbid conditions. Incoming PGY2 residents must have a thorough understanding of the most common diseases seen in an adult patient including neurology, psychiatry, endocrine, pulmonary, infectious diseases and renal disorders.^{12,13} and experience with complex decision-making. Before beginning a PGY2 Cardiology residency, the resident should have a strong background and experience in managing adult medicine patients during their PGY1 program. Ideally, PGY1 training should have been completed in an interprofessional setting to develop a skillset in negotiation and advocacy for the patient.

Each PGY2 residency program must have a standardized purpose statement and list types of postgraduate positions for which residents are qualified.⁵ Efforts to prevent disease or to slow the progression of cardiovascular disease may be the focus of some PGY2 programs whereas other programs may focus on preparing residents to care for critically ill patients or an entire spectrum of acuity (eg, mainly ambulatory vs critical care environment).¹⁴ Ideally, a resident finishing a PGY2 residency in cardiology would be competent to manage both acute and chronic cardiovascular conditions.

4.1 | Recommendations regarding resident selection

4.1.1 | Recommendations

It is recognized that the selection of a PGY2 Cardiology resident is highly individualized to a program and considers numerous characteristics of candidates. However, based on the experience of the writing panel, there are several characteristics of PGY2 Cardiology candidates (beyond the minimal qualifications defined by ASHP) that are of particular importance and should be prioritized by programs in their assessment of residency candidates [O]:

- Successful completion of an ASHP accredited PGY1 program with strong experience in general adult medicine. Preferably, residents should have rotations in adult internal or family medicine. Strong candidates will have experience in several medicine subspecialty rotations, such as infectious disease, nephrology, anticoagulation, psychiatry, endocrinology, pulmonology, and/or medical intensive care. While many PGY2 Cardiology residency candidates will have a rotation in cardiology, candidates with broad experience in adult medicine areas in addition to cardiology (rather than predominantly in cardiology) will likely be better prepared to care for the complex cardiology patients with multiple comorbidities.
- Professional maturity (eg, prioritization of quality patient care related actions, respect for others, acceptance and application of constructive feedback, self-awareness)¹⁵⁻¹⁷
- Personal values (eg, honesty, discipline, and curiosity)¹⁸

4.2 | Recommendations regarding preceptors and mentoring

4.2.1 | Recommendations

The residency program should be composed of at least two core clinical pharmacist preceptors as defined by ASHP guidelines (including the program director).⁵ [SR] It is recommended that both of the core clinical preceptors have an active clinical practice in areas where the resident can have direct patient care experience in the mandatory cardiovascular topic areas. [O] It is suggested that residency programs have other noncore preceptors involved that precept non-clinical rotations and/or elective rotations. [O]

It is important to ensure Residency Program Directors (RPDs) are adequately supported to run their programs. Having the RPD be the primary preceptor for all (or most) rotations is not a long-term sustainable model. The lack of diversity in preceptor expertise may lead to an inability of the program to meet the resident's learning needs. Nonpharmacist preceptors (eg, physicians, advanced practice nurses) may serve as preceptors to support the diversity of expertise as long as they meet the requirements set forth by the ASHP guidelines, although it is recommended the majority be pharmacists.

4.2.2 | Recommendations

The residency program should have an infrastructure that includes administrative support, skilled preceptors, and a program director that has time, interest, and skills for leading the residency program. [SR] It is the responsibility of the program director to assure the resident receives adequate mentorship. [SR]

It is important that preceptors chosen for the program have the aptitude, interest and support structure to provide guidance to the cardiology pharmacy resident. In most cases, program directors serve as the primary mentor for the resident, though it is recognized that other preceptors may serve in these roles as well. Program directors, however, should be comfortable in the roles of mentor and model, not just preceptor/program director. In addition to the program director, preceptors involved in the program can help mentor and serve as role models. Offering different perspectives on similar clinical problems and leadership in additional therapeutic areas, ideally allow the resident to grow in development of their own practice style and a deeper expertise. Preceptors should be provided appropriate professional development ensuring that they are appropriate role models, have an optimal learning experience, and have the tools to continue to grow in their own expertise.

Throughout the residency year, it is also important that the resident who may come into the PGY2 in Cardiology program with pre-established mentors, continues to develop relationships with other mentors. Mentorship is often a personal but professional relationship that can develop formally through mentor or advising programs or more organically. In both cases, program preceptors often play a part. Mentorship has been shown to be particularly important in supporting the resident in career planning and work-life balance.^{19,20}

4.3 | Recommendations regarding expectations for progress/milestones

4.3.1 | Recommendations

RPDs should have sufficient experience precepting PGY2 residents that they [RPDs] are able to judge baseline knowledge, skills, and abilities and subsequently appropriate progression over the PGY2 year. [SR] Program directors should also be able to inform and/or develop corrective action plans, or design, redesign, or update development plans that factor in resident progression and milestone attainment. [SR]

An assessment of baseline skills upon entry into the PGY2 is an ASHP standard and serves as the foundation for the initial development plan. Each resident comes into a program with unique strengths and weaknesses. If a resident has already completed certain objectives (eg, ACLS), then there is less need to focus a large amount of time and effort in an area that a resident has already demonstrated competency.^{21,22}

Cardiology pharmacy residency “milestones” facilitate a pathway to independent (unsupervised) practice and are defined as the knowledge, skills, attitudes, and other attributes for each of the ASHP PGY2 competencies. Milestones may be divided into prespecified intervals over the 12-month residency. Example milestones for HF are

TABLE 4 Example of PGY2 Cardiology residency milestones in heart failure

	Quarter 1	Quarter 2	Quarter 3
Knowledge: Know the appropriate pharmacological treatment for the prevention of heart failure in patients with either ACC Stage B or C heart failure	X		
Knowledge: Know the indications, contraindications, and clinical pharmacology for IV, vasoactive, and inotropic drugs used for cardiovascular support in advanced heart failure.		X	
Patient Care: skill to evaluate and manage patients with chronic heart failure		X	
Patient Care: skill to evaluate invasive hemodynamic monitoring			X
Professionalism: interact respectfully with patients, families, and all members of the healthcare team	X		
Communication: communicate with and educate patients and families, being cognizant of cultural, ethnic, and socioeconomic backgrounds	X		

provided in Table 4. Evaluation tools to track progress with milestones may include self-reflection, simulation, and direct observation.

Resident development plans should describe progressive autonomy granted by preceptors following direct observation of actual performance or use of indirect methods (eg, verbal presentation, input from others, unobtrusive reviews generally conducted through medical record review). The level of trust extended may include increased oversight, either in the form of little to no independence or partial independence, vs complete autonomy to complete tasks. Characteristics that support or impede trust, such as clinical knowledge and skill, critical thinking, reliability, propensity to make errors, and development of use of softer skills should be included in the resident development plans.^{23,24}

The program director will prioritize, organize, and reorganize the PGY2 training year when opportunities for improvement are identified; specific, measurable, and obtainable objectives must be written and reviewed at least quarterly to ensure steps are taken to improve area of weakness and highlight areas of strength.²⁵

Example of an area for development:

The resident struggles with balancing clinical responsibilities and the demands of longitudinal scholarly activities. New objectives may include development of project timelines and creation of a list of priorities on a daily, monthly, and quarterly basis.

Examples of an area achieved:

- After the first quarter, resident is making more substantive clinical recommendations regarding cardiovascular pharmacotherapy.

Resident has grown beyond recommendations that are “low-hanging fruit”/low impact recommendations.

- After the first quarter, resident is becoming relied upon by other healthcare professionals as a cardiovascular team member.
- After the second quarter, notable increases in resident's confidence regarding cardiovascular knowledge and patient care skills.
- After the second quarter, resident has thoroughly thought through complex patient care issues before bringing questions to the preceptor. The resident has researched well and is presenting only with issues that are not as easily answered by guidelines or clinical trial data.

Unfortunately, even with the best preceptorship/mentorship, there are incidences where the resident actually fails to meet minimal expectations or regresses, in which case a corrective plan must be put into place. If a corrective action plan is required, it should be consistent with the institution's human resources requirements, particularly if it is in an area which violates institutional policies or compromises patient care.

4.4 | Recommendations regarding program and learning experience structure

4.4.1 | Recommendations

It is recommended that at least 9 out of the 12 residency months (or 75%) be scheduled in settings for direct patient care. [SR] At least six out of these nine rotations are suggested as core/required rotations that give the resident experience in the mandatory topic areas. [SR] Teaching-related activities (eg, precepting-related activities, in-services, lectures) should account for 10% of scheduled time. [SR] Approximately 5%-10% of time should be scheduled for completion of residency projects. [SR]. Residents should be afforded 5%-10% of scheduled time to complete administrative activities (eg, orientation, recruiting activities, interviewing, and PharmAcademic). [SR] The time for nonpatient care activities may not need to be scheduled as a discrete rotation (depending on logistics of specific programs).

The 2017 ASHP Required Competency Areas, Goals and Objectives for PGY2 Cardiology Residencies clearly define those disorders/topic areas that require direct patient care experience in the associated appendix.⁵ It is highly likely that it will require at least 9 months of direct patient care in order to manage enough patients with these disorders to gain competence. Some of these disorders will require experience in a critical care environment, whereas others may be met in ambulatory clinics. Please refer to the clinical and therapeutic content expertise (medical knowledge) section for more details. The number of months in each environment will vary among practice sites due to variation in clinical practice sites and their patient populations. The amount of time dedicated to teaching-related activities (~10%) may overlap with topics that are required to master but do not require direct patient care experience or those topics that are listed as elective. Although it is not required, the resident's project

may also address one of the mandatory topic areas. Lastly, it is important that the resident be given ample time for professional development including the opportunity for a thorough self-assessment. This may be accomplished through documentation in online residency tracking software (eg, PharmAcademic).

4.4.2 | Recommendations

The residency program should allow the resident to participate in the management of patients with cardiovascular disease in *both acute/inpatient and chronic/outpatient settings*. [SR] The residency program should give the resident experiences in both critical care and noncritical, but acutely ill patients. [SR] The amount of time in a specific setting may vary, depending on the clinical focus of the training site. Chronic/outpatient experiences can be set up either as a longitudinal rotation or as discrete rotations. The experience should be conducted so that the resident has the opportunity to see the same patients and evaluate the outcome of their intervention(s) made at prior visits (eg, redesign opportunities). The resident should participate in the direct patient care of chronic cardiovascular diseases in more than traditional anticoagulation [warfarin] management when available (eg, HF, lipids, hypertension, and secondary prevention). [O]

Since cardiovascular disease is so common among adults in developed countries, it is essential that the specialist in cardiology have a thorough understanding of how to manage risk factors for cardiovascular disease as well as the acute and chronic management of specific cardiovascular disorders. It is possible that some of these ambulatory rotations could be met in a primary care clinic experience with an internal medicine or family medicine practice site. The PGY2 Cardiology RPD should consider using a range of other preceptors to provide an optimal program experience. For example, ambulatory care clinical specialists with a strong focus in cardiovascular disease management of patients with hypertension, dyslipidemia, HF, and other chronic cardiovascular disorders and can contribute to the overall education of the cardiology resident. Transplant clinical specialists may be able to provide direct patient care experiences with heart transplant in either the inpatient or ambulatory setting.

4.4.3 | Recommendations

The resident's rotations should be set up in a way that allow for development/growth and assessment of the resident's independence. For example, consideration should be given to allowing the resident to have repeated rotations in certain settings with defined expectations of increasing independence/responsibility/growth. We recommend that this would be best accomplished in areas where the focus is on mandatory topics/cardiovascular conditions (eg, ACS, HF, and hypertension). [SR] The preceptor/RPD should clearly define how the expectations regarding clinical knowledge, impact of interventions, efficiency, independence, and accountability/responsibility should grow/evolve over the course of repeated learning experiences. [SR]

Cardiology pharmacy practice requires an in-depth and dynamic knowledge base and clinical expertise, which is generally acquired

only through rigorous, disciplined training and progressive accrual through repetition and increasing responsibility during a PGY2 residency.¹⁵ This could be accomplished through repeated rotations either consecutively (eg, October and November) or sequentially (October and February). When the resident repeats the rotation, the expectations and responsibilities should be escalated. Learning objectives for each repeat rotation should be separate and/or unique, so it is clear how expectations progress. The resident may assume responsibility for more patients and should be able to manage more complex problems. Once the resident has been evaluated as competent with any particular type of patient population, the level of autonomy should be increased throughout the residency program.

4.4.4 | Recommendations

The residency program should have regular opportunities for the resident to engage with peers/other residents if available. [SR] The RPD/preceptors/residency oversight committees should engage with resident(s) regularly to ascertain the well-being of the resident(s). [SR] Actual duty hours should follow the ACGME standards for maximum hours of work per week. [SR]

Professional, situational, and personal stresses may arise in any clinical learning environment.^{26,27} PGY2 Pharmacy residents, particularly those who work more than 60 hours per week, experience increased stress compared to the general population.^{28,29} Stress is associated with depression, hostility, and dysphoria. In an exploratory pharmacy residency survey in Tennessee, the incidence of self-reported depression was high (40%) using a nonvalidated tool with many residents reporting poor work-life balance (36%) and one or more episodes of suicidal ideation (22%).³⁰ The risk of not addressing a resident's well-being not only impacts our trainees, but also patient safety and clinical outcomes.

Program directors should apply strategies that target both resident workload and community in the conduct of their residency program to reduce burnout and improve mental health.^{31,32} Potential interventions to support the well-being of residents include but are not limited to:

- Regularly reviewing work hour reporting by residents or other non-biased reporting strategies to assure work hours follow ACGME standards (maximum 80 hours per week, averaged over a four-week period, inclusive of any in-house or at-home call), but if possible to less than 60 hours per week.
- Allowing for adequate time for recovery (eg, processing of grief) following stressful events (eg, code participation, death of a patient).
- Assigning a residency facilitator or mentor (a wise and trusted counselor) can assure someone is readily available to talk to and function as a guide throughout the residency year.
- Assuring preceptors who are cognizant of work load are positioned to check in with the resident at busier times in the academic year such as before major project due dates in order to assist in evaluation of responsibilities and priorities (eg, time management support).

- RPDs should have regularly meetings (eg, quarterly) with preceptors to review the resident's schedule and workload throughout the year.
- Monitoring of resident stress levels using readily available (free) tools such as the 10-item Perceived Stress Scale (PSS10).
- Scheduling or designing rotation schedules to avoid isolation from their peer group, such as scheduling joint journal clubs, case presentations, or topic discussions.
- Facilitating opportunity for social interaction with peer group at work or outside of work within the same institution or across residency programs.
- Implementation of weekly or monthly resident meetings to allow time for residents to reflect on residency areas of dissatisfaction. These could be communicated directly to the RPD, or at a Residency Council/Review Committee Meeting.

4.4.5 | Recommendations

The RPD should engage in evaluation of their residency program by seeking feedback from residents. [SR] In addition, the RPD should track the employment of their resident graduates and see if the program is meeting the goal outlined in the purpose statement. [SR]

Residents should be invited to provide constructive feedback to the RPD and preceptors. Bidirectional feedback is vital for continued growth and improvement of the training program.²⁵ Feedback identifies program and preceptor strengths, highlights areas for development, and is useful for identifying whether the residency program fulfills its purpose. The hierarchical difference between preceptors and residents makes verbal face-to-face feedback problematic. Providing a confidential, formative feedback system to describe preceptor and program strengths and weaknesses may encourage honesty and openness. Although some suggestions may not be able to be implemented due to financial or other constraints, the RPD should consider alterations to the program if they are rational and consistent with achieving the competencies, goals and objectives outlined by ASHP.

5 | CLINICAL AND THERAPEUTIC CONTENT EXPERTISE (MEDICAL KNOWLEDGE)

A pharmacist who specializes in cardiology focuses on the care of cardiovascular patients based on evidence-based guidelines and pharmacotherapeutic knowledge. Pharmacists who specialize in cardiology work as members of multidisciplinary teams in a various settings, including coronary care units (CCU), telemetry units, medical wards, emergency departments (ED), medical intensive care units (ICU), surgical intensive care units (SICU), cardiovascular intensive care units (CVICU), and specialty outpatient clinics which focus on dyslipidemia, HF, hypertension, anticoagulation, cardiac transplant, and arrhythmias.^{14,33,34}

The activities of cardiology pharmacists identified by the HFSA/ACCP Cardiology PRN writing group consist of an array of

clinical activities.³³ In addition, they can be involved in clinical studies, health services, basic and/or translational research.³⁵ According to the ASHP required competency areas, goals, and objectives for PGY2 Cardiology pharmacy residencies, a PGY2 pharmacy residency in cardiology should focus on the care of patients with or at risk for cardiovascular disease.⁵ At the conclusion of residency training, pharmacists should have sufficient experience caring for patients with cardiovascular disease(s) and mastery of knowledge, with an emphasis on pharmacotherapy, to serve as an expert source on medications used to treat patients with varied disease complexity—from mild to severe—across various practice settings (eg, outpatient, inpatient, and critical care). These clinical cardiovascular pharmacy specialists should also be able to utilize their expertise and clinical judgment to decipher areas of uncertainty. Furthermore, as cardiovascular diseases encompass and overlap with many concomitant conditions, a holistic understanding of patients' pharmacotherapeutic issues is necessary. Therefore, PGY2 Cardiology residents are expected to develop expertise in pharmacotherapy for the treatment and prevention of cardiovascular disease as well as common medical and surgical problems occurring in these patients.

Given the differences in both characteristics of and resources available to the various PGY2 cardiology residency sites, residents may not have direct patient care exposure to all of the cardiovascular diseases for which the clinical cardiovascular specialist is expected to be an expert. In such instances, exposure to these cardiovascular diseases may be in the form of case-based or topic discussions. Since exposure to several rare cardiovascular diseases or highly specialized areas of practice may be limited across residency sites, mastery of these topics should be considered elective.

5.1 | Recommendations

To provide a solid foundation for becoming a cardiology pharmacy specialist, exposure to these core topic areas is necessary: cardiovascular anatomy and physiology, cardiovascular risk reduction, atherosclerotic disease, dysrhythmias, HF, cardiothoracic surgery, cardiac critical care, antithrombotic therapy, pulmonary hypertension, and cardiac device therapy. (Table 2) [SR]

5.2 | Recommendations

For mandatory topics, the depth and breadth of exposure should be sufficient to allow the resident to master the broad knowledge required of clinical cardiovascular pharmacy specialists in these areas including, but not limited to epidemiology, pathophysiology, risk factors and etiology, signs and symptoms, pharmacology of medications used for treatment, and comprehensive pharmacotherapy treatment plans. [SR] Ideally, the majority of exposure to mandatory topics should be via direct patient care, however, if this is not possible, case-based and topic discussions are acceptable in some instances. [SR] To optimize exposure to the mandatory topics, residents should have direct patient care exposure in both inpatient and ambulatory care settings, with time allocation individualized to practice site. [SR]

Upon successful graduation from PGY2 residency, graduates need to be prepared to act as an integral member of interdisciplinary teams as the cardiovascular pharmacotherapy experts. The primary focus should be on the application of knowledge of core cardiovascular disease state through repetitive direct patient care exposure, as outlined in Table 2. This would include educating and providing safe and effective use of medications, optimizing therapeutic regimens and offering alternative therapies as necessary.⁵ Since cardiovascular disease is not limited to a single healthcare setting, graduates must be well-versed in cardiovascular disease states which encompass both inpatient and outpatient settings. Required case-based or topic discussions may be less commonly encountered as various residency sites, but are still necessary in order to have a solid foundation in cardiovascular pharmacotherapy. If this is the case, investigating off-site learning experiences may be needed to address topic areas not available at the primary site.

5.3 | Recommendations

Residents may also be exposed to rare cardiovascular diseases and/or highly specialized areas of practice; these experiences should be elective based on disease prevalence and services provided at each site. [O]

Elective patient experience and/or case-based or topic discussions encompass rare or highly specialized cardiovascular topics. Based on the residency site, these topics may be incorporated into the PGY2 residency schedule.

To summarize, the Cardiology PRN has created these recommendations to assist programs with development and delivery of PGY2 cardiology residencies. Program directors should keep in mind that these are not intended to be prescriptive; RPDs must consider individual opportunities and obstacles within a training site as well as individual needs of a resident. It is the hope of the PRN that these recommendations are a useful supplement to accreditation guidelines and standards in the delivery of PGY2 cardiology residency programs.

CONFLICT OF INTEREST

Dr. Nappi declares her spouse is on the Speaker Bureau for Allergan, and has participated as an advisory board member for Roche Diagnostics, Nabriva, Melinta, Tetrphase, and Motif. Dr. Ng has received research support from Otsuka America Pharmaceutical and has served as a consultant for Amgen. No other authors report any potential conflicts of interest.

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How to cite this article: Ng TMH, DiDomenico RJ, Ripley TL, et al. An opinion paper of the Cardiology Practice and Research Network of the American College of Clinical Pharmacy: Recommendations for training of cardiovascular pharmacy specialists in postgraduate year 2 residency programs. *J Am Coll Clin Pharm*. 2020;3:95–108. <https://doi.org/10.1002/jacc.5.1148>