

# Advanced Training in Interventional Cardiology: Are We Meeting Our Standards?

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As a coronary interventionalist, university faculty, and past training program director, I was pleasantly surprised to see the 2023 American College of Cardiology (ACC)/American Heart Association (AHA)/Society for Cardiovascular Angiography and Interventions (SCAI) advanced training statement on interventional cardiology (coronary, peripheral vascular, and structural heart interventions): a report of the ACC Competency Management Committee with lead authors Drs. Ted Bass and Dawn Abbott, and 30 distinguished, nationally recognized coauthors.<sup>1</sup> This statement is among the most comprehensive and updated reviews on what is needed to train to become a complete interventionalist in coronary, peripheral, and structural heart interventions. While there is a summary from the ACC<sup>2</sup>, I thought it would be worthwhile to give you my take on the highlights of the training document.

Coincidentally, I also happened across an article on TCTMD.com discussing bullying during cardiology training.<sup>3</sup> While you might think these are widely disparate topics, I think they are worth talking about in the same setting, as we hope to be training not just future interventionalists, but leaders as well. This part of the discussion will address professionalism in the training period and beyond (see point #8 below).

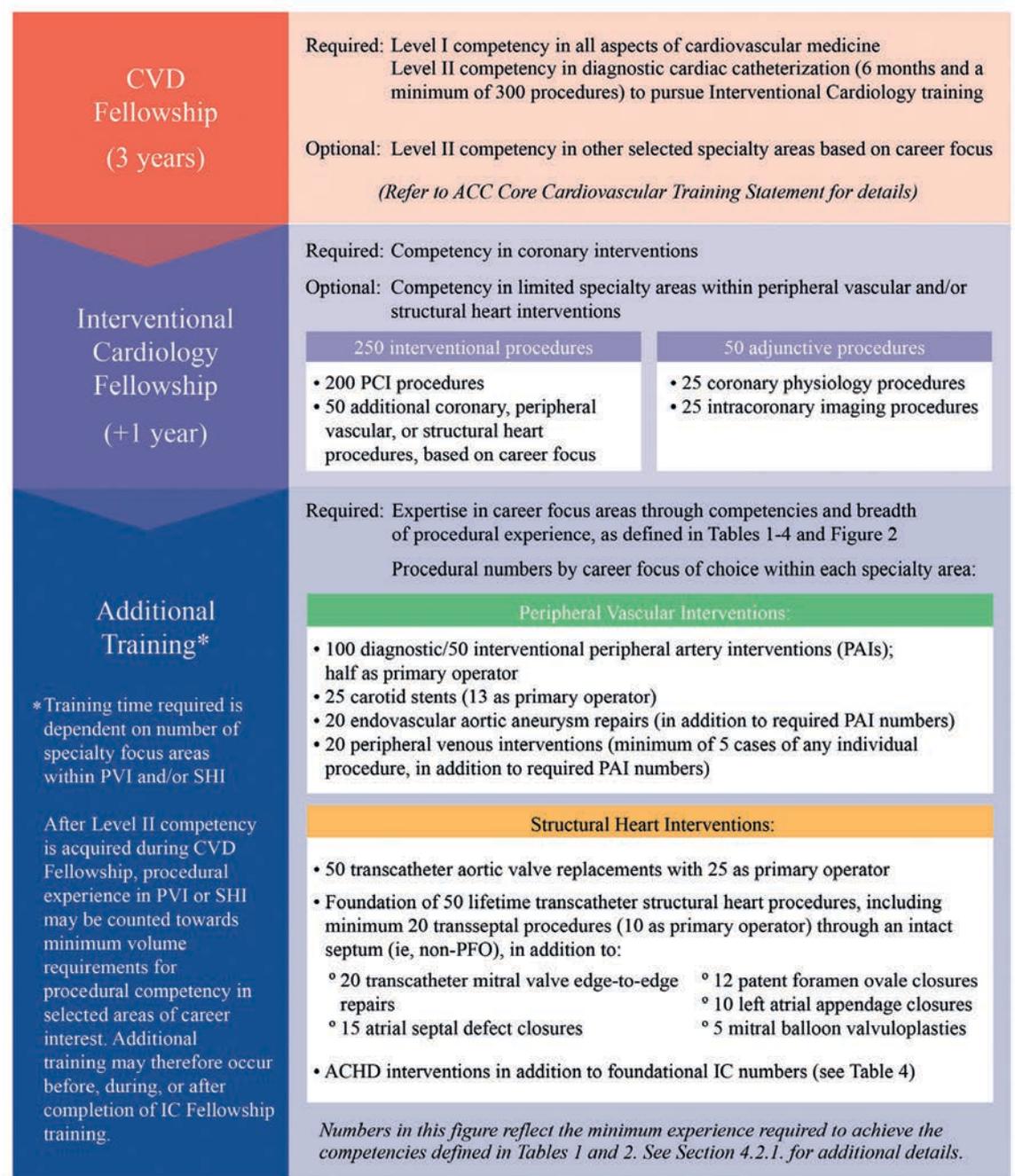
Of course, no single document can cover everything that serves as a standard or that establishes foundational information in the cath lab. The training documents wisely refers readers to further important guidelines and consensus papers to fill in background that an interventional cardiologist and cath lab personnel will need. For example, much of our current cath lab practices have been well established and described in the ACCF/AHA/SCAI 2013 update of the clinical competence statement on coronary artery interventional procedures<sup>4</sup>, as well as the 2021 SCAI expert consensus update on best practices in the cardiac catheterization laboratory<sup>5</sup>.

The advanced training standard paper explains the different levels of training, methods, and procedural numbers needed. It also sets the criteria for training facilities, faculty qualifications, lab equipment, and resources for coronary, peripheral, and structural interventional program development. The 53-page document provides summaries, tables and criteria covering didactic

program development, clinical experience, and hands-on procedural expectations (Figure 1). Here are my top 10 take-home points, excerpted from the ACC summary.<sup>2</sup>

## 1) Core competencies.

The building blocks or core competencies of an interventional training program are shown in Figure 2. The trainee needs to acquire a substantial knowledge basis for the diagnosis and treatment of cath lab emergencies and complications, as well management of several uncommon clinical conditions and syndromes (such as spontaneous coronary artery dissection, coronary vasospasm, microvascular dysfunction, myocardial infarction with non-obstructive coronary arteries [MINOCA], takotsubo cardiomyopathy, inflammatory vasculitis, myocardial bridging, coronary artery fistula, and coronary artery aneurysms). The document is well organized and easy to read,



ACC = American College of Cardiology; ACHD = adult congenital heart disease; CVD = cardiovascular disease; IC = interventional cardiology; PAI = peripheral artery intervention; PCI = percutaneous coronary intervention; PFO = patent foramen ovale; PVI = peripheral vascular intervention; SHI = structural heart intervention.

**Figure 1. Interventional Cardiology Training Pathway.**

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and to its credit, provides excellent guidance not only for trainees but also for anyone working in the field.

2) A single designated program director and ≥1 additional clinical faculty members.



3) A defined didactic, clinical, and practicum (hands-on experiences) program.



4) Defined goals in medical knowledge, patient care and procedural skills, systems-based practice, practice-based learning, professionalism, and interpersonal and communication skills.

A proficient interventional cardiology training program requires experience in the 6 domains of knowledge and skills noted above, but also in establishing multidisciplinary collaboration. While it could be said that this should be intuitive, the document emphasizes to trainees that they should develop working relationships with cardiac surgeons and those having advanced training in electrophysiology, echocardiography, imaging experts using CMR and computed tomography angiography, heart failure specialists, and advanced practice providers. Participation in multidisciplinary conferences to foster team decision-making is also critical to the training and for future best practice patterns.

5) One year of additional fellowship training for Level 3 competency.

The training pathway for interventional cardiology (Figure 1) provides details on what is needed

Building Blocks of the Profession	
Core Interventional Cardiology Procedural Skills (based on career focus)	
<p align="center"><b>Coronary Interventions</b></p> <p><b>Catheter Skills (Angioplasty/Stenting)</b> - Includes exposure to a broad range of adult patient ages, clinical presentations, pathologies, and therapies, including a range of anatomical lesion subsets, in de novo and previously stented vessels such as thrombotic, ostial, bifurcation, and heavily calcified lesions, bypass grafts, and chronic total occlusion</p> <p><b>Access/Closure</b> - Includes radial and femoral, large bore, ultrasound guidance, closure devices</p> <p><b>Procedural Complication Prevention and Management</b> - Use of embolic protection devices, covered coronary stents, pericardiocentesis, microembolization techniques, and snares</p> <p><b>Atherectomy/Plaque Modification</b> - Use of rotational, orbital, laser atherectomy, or intravascular lithotripsy</p> <p><b>Mechanical Circulatory Support</b> - Use of intra-aortic balloon pump and additional devices as available (eg, transvalvular axial flow pump, transeptal continuous flow centrifugal pump, extracorporeal membrane oxygenation)</p>	
*	*
<p align="center"><b>Peripheral Vascular Interventions</b></p> <p><b>Catheter Skills (Angioplasty/Stenting)</b> - Use of balloon-expandable and self-expanding stents and stent grafts</p> <p><b>Access/Closure</b> - Includes antegrade, retrograde, contralateral, pedal, popliteal, and large bore</p> <p><b>Procedural Complication Prevention and Management</b> - Use of embolic protection devices, covered stents, microembolization techniques, and snares</p> <p><b>Atherectomy/Plaque Modification</b> - As applies to peripheral artery interventions</p> <p><b>Thrombectomy/Thrombolysis</b> - Includes mechanical thrombectomy (large and small vessel) and familiarity with thrombolytic agents and their use</p>	<p align="center"><b>Structural Heart Interventions</b></p> <p><b>Catheter Skills (Device Placement)</b> - Use of balloon-expandable and self-expanding valve prostheses, appendage occlusion devices, and transcatheter edge-to-edge valve repair devices</p> <p><b>Large-Bore Vascular Access Management</b> - Includes femoral and alternative access (eg, transcaval and transaxillary), ultrasound guidance, and closure devices</p> <p><b>Procedural Complication Prevention and Management</b> - Use of cerebral embolic protection and prevention of acute coronary occlusion, management of acute hemodynamic compromise and use of hemodynamic support devices, management of large-bore access site complications, management of device embolization, and management of acute tamponade</p> <p><b>Coils and Other Embolization Devices</b> - Includes coils, gelfoam, glue, vascular plugs</p> <p><b>Intracardiac Echocardiography</b> - Potentially required for PFO/ASD closure guidance and other structural interventions</p> <p><b>Rail Techniques</b> - Includes AV loop</p> <p><b>Retrieval Devices and Techniques</b> - Use of various snares</p> <p><b>Transseptal Procedures Through an Intact Septum</b> - Non-PFO, required for left-sided cardiac procedures only</p>
<p align="center">* Core coronary interventional skills are required for all 3 specialties</p>	

ASD = atrial septal defect; AV = arteriovenous; PFO = patent foramen ovale.

Figure 2. Building Blocks of the Profession.

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in a 3-year cardiovascular disease fellowship for general cardiology levels 1 through 3. Level 1 is competency in all aspects of cardiovascular medicine. Level 2 is competency in diagnostic catheterization with 6 months training and 300 procedures, and a level 2 option would be additional competencies in other selected specialties, like electrophysiology or critical care, based on career focus. The didactic components of the training program for level 3 trainee are extensively described and include common and uncommon conditions, some of which the trainee may never encounter, but through conferences, online teaching, and experiential exposure, one can

gain some familiarity. Clearly, the trainees will have to approach these complicated patients in consultation with more experienced practitioners in their initial experience. For interventional cardiology, at least one additional fellowship track year is proposed, with competency in coronary interventions achieved by performing 200 percutaneous coronary intervention procedures with 50 adjunctive procedures of coronary physiology and intracoronary imaging, and 50 additional coronary, peripheral vascular, or structural heart procedures as well. The components and curriculum milestones of a level 3 training program in interventional cardiology are worth reviewing.

**Table 1. Professionalism.**

<b>Professionalism</b>	
1.	Demonstrate respect, consideration, and empathy for patients, families, and all members of the health care team.
2.	Purposefully engage with individuals of different demographic and socioeconomic backgrounds to enhance cultural awareness.
3.	Recognize and reduce the role of implicit and explicit biases and interpersonal relationships.
4.	Practice within the scope of personal expertise, training, and technical skills.
5.	Recognize the need for and obtain consultations in a timely manner.
6.	Know current evidence-based clinical practice guidelines, consensus statements, appropriate use criteria, and performance measures relevant to scope of practice.
7.	Identify, disclose, and manage relationships with industry and other entities to minimize bias and undue influence on clinical decision-making.
8.	Demonstrate high ethical standards in personal and professional conduct.
9.	Take responsibility and follow through on professional commitments and obligations in a timely manner.
10.	Identify potential for impaired professional performance in oneself and colleagues, and take action to mitigate.
11.	Attend to one's own health, well-being, and abilities to maximize personal and professional performance.
Evaluation Tools: direct observation, multisource evaluation, reflection, and self-assessment	
<b>Interpersonal and Communication Skills</b>	
1.	Assess and manage human responses experienced by individuals with cardiovascular disease (eg, depression, spiritual distress, nonadherence, decisional conflict).
2.	Communicate with patients, families, and other health care professionals in an effectively, timely, and culturally competent manner.
3.	Engage patients in shared decision-making based on balanced presentation of potential risks, benefits, and alternatives, factoring in patients' values and preferences.
4.	Review medical records, complete documentation, and communicate results of diagnostic findings and management strategies to patients and collaborating health care professionals in a timely manner.
5.	Lead and collaborate in interdisciplinary and cardiovascular care teams to promote a culture of well-being, diversity, and inclusion.
6.	Compassionately discuss sensitive/difficult topics, including end-of-life care and care of critically ill patients.
7.	Provide emotional support to patients and families.
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**6) Recommended number of peripheral vascular interventions.**

Since my cath lab does not routinely do peripheral vascular disease (PVD) interventions, we rely on our vascular radiologists (we have no dedicated cardiology PVD program). For those wishing to develop such a program, the training document enumerates the additional resources required to build a PVD program. The document emphasizes establishing good working relationships with vascular imaging specialists for complex anatomy, vascular surgeons, cardiothoracic surgeons, and anesthesiologists for these procedures. Such programmatic integration may also benefit from the collaborative effort, particularly on hybrid procedures. Additionally, interventional cardiologists not working with PVD patients would not automatically consider the need for wound care teams with expertise in hyperbaric therapy, podiatry, orthopedics, occupational and physical therapy, as well as rehabilitation teams, all of which will be essential to enhance the PVD training experience. This document also describes the minimum peripheral volume typically necessary for the development of competencies for advanced adult congenital heart interventions. The additional training for peripheral vascular disease suggests 100 diagnostic, 50 intervention-

## **Leaders and teachers should model the best behaviors. There is no place for rudeness in the workplace.**

al peripheral vascular interventions, 25 carotid stents, 20 endovascular aneurysm repairs, and 20 peripheral vascular interventions. It should be acknowledged that many training programs may be challenged by the proposed numbers without additional study years.

**7) Recommended number of structural heart interventions.**

As most large training programs have structural heart disease (SHD) interventional procedures, the document recommended that additional SHD faculty should include a board-certified interventional cardiologist with expertise in structural heart interventions to serve as an adjunct program director. Trainees going into SHD interventions should acquire further experience in a variety of important equipment (such as intracardiac echo, intravascular plug devices, covered stents, snares, etc.) to manage complications of SHD interventions. For SHD training, 50 transcatheter aortic valve replacements with 25 as primary operator is recommended, with 50 lifetime transcatheter structural heart procedures

References are available with the article online. Scan the QR code with your smartphone camera:



(including 20 transseptal punctures for non-patent foramen ovale left atrial access).

**8) Trainees are expected to function effectively as leaders.**

An appreciation of common professional behavior is integral to personal competencies and is relevant to all clinical cardiovascular disease specialties. Interpersonal and communication skills are often not addressed in medical training. Over the last few decades, a transformation of medical teaching and apprentice-style learning has occurred. Today's faculty instructors have learned how to convey information through didactic talks, modeling during clinical encounters, and demonstrating with hands-on, one-to-one practical applications. However, there must be conscious effort to make the trainees experience rewarding without psychological mistreatment. As many of my senior colleagues trained in the 70's and 80's, we accepted harsh treatment and demeaning language. Surviving a residency with every other night on call was a badge of honor. Putting up with mean-spirited attendings was de rigueur. Over the years, medical education evolved to improve its methods and approach to learning. In keeping with modern standards of professional behavior, instructors have abandoned their old bad habits.

Unfortunately, bullying in some programs occurs.<sup>3</sup> Leaders and teachers should model the best behaviors. Sexist, racist, and discriminatory, abusive attitudes are no longer tolerated. There is no place for rudeness in the workplace. One can read the newspapers to know that large and small

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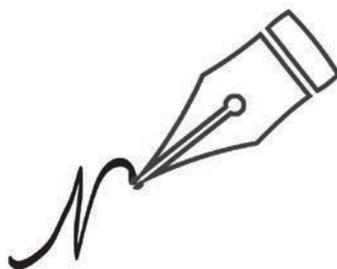
medical institutions, universities, and professional societies have yet to reeducate certain doctors, administrators, and others behaving badly.

Teaching by inquiry, questioning, and using a Socratic method is more effective and productive than what was called "pimping", directing rapid-fire questions meant to expose a lack of knowledge. Humiliating students discourages learning and concept synthesis. It does not elevate the instructor and in fact only makes him/her less approachable and therefore less valuable to the learning team. In contrast, promoting critical thinking through dialog and mutual respect will yield best results, and build trust and growth. Fellows will become leaders and should adopt the highest ethical and moral standards of our profession.

**9) Regular evaluation of trainees' competencies.**



**10) The interventional cardiology program director must certify trainee competency in procedural skills before the trainee can sit for the board certification exam.**



**The Bottom Line**

The interventional training document provides foundational information for all interventional cardiology training programs. It is an excellent guide to the didactic materials that are needed for an accredited program. The document also codifies what we have been striving to achieve in our training programs and qualifies our graduates to take their place in the community with high competency in their chosen field. We should remember that we personally will need the cardiologists that we train to take care of us and our families. Let all of us working in the cath lab do the best job we can to meet that goal. ■

Article references are available online at [cathlabdigest.com](http://cathlabdigest.com)



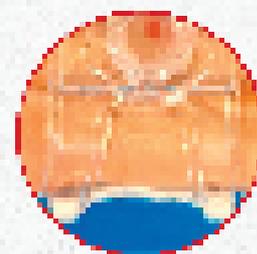
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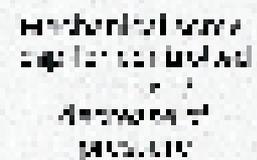


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