

## COUNCIL COMMENTARY

# COCATS 4

## Securing the Future of Cardiovascular Medicine



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### ABSTRACT

The latest iteration of the Core Cardiology Training Symposium (COCATS 4) provides a potentially transformative advancement in cardiovascular fellowship training intended, ultimately, to improve patient care. This review addressed 3 primary themes of COCATS 4 from the perspective of fellows-in-training: 1) the evolution of training requirements culminating in a competency-based curriculum; 2) the development of novel learning paradigms; and 3) the establishment of task forces in emerging areas of multimodality imaging and critical care cardiology. This document also examined several important challenges presented by COCATS 4. The proposed changes in COCATS 4 should not only enhance the training experience but also improve trainee satisfaction. Because it embraces continual transformation of training requirements to meet evolving clinical needs and public expectations, COCATS 4 will enrich the cardiovascular fellowship training experience for patients, programs, and fellows-in-training. (J Am Coll Cardiol 2015;65:1907-14) © 2015 by the American College of Cardiology Foundation.

The latest iteration of the Core Cardiovascular Training Statement (COCATS 4) has the potential to transform cardiovascular fellowship training, making perhaps its most important advancement in 20 years (1). The initial guidelines for training in adult cardiovascular medicine were published in 1995 as a consensus statement from the COCATS held at Heart House in Bethesda, Maryland (2). The original COCATS recommendations encompassed 10 task force reports, including clinical cardiology and various subspecialties. Subsequent updates were published as COCATS 2 in 2002, including additional task force reports to address training in vascular medicine, peripheral catheter-based interventions, and cardiovascular magnetic resonance (3). A more focused update in 2006 (4) addressed advances in cardiac electrophysiology and

several imaging modalities. Further revisions published in COCATS 3 (5) not only included how fellows-in-training (FITs) could develop expertise as comprehensive, multimodal cardiovascular imaging specialists but also underscored the importance of the 6 core competencies (medical knowledge, patient care, interpersonal and communication skills, professionalism, practice-based learning and improvement, and systems-based practice) formulated by the Accreditation Council for Graduate Medical Education (ACGME) in 1999 (6,7).

Building on this extensive history and contextualized by an ever-changing cardiovascular workforce landscape (8,9), the American College of Cardiology's Competency Management Committee released COCATS 4 in this issue of the *Journal* (1). Cardiology is a dynamic discipline that changes

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## ABBREVIATIONS AND ACRONYMS

**ACGME** = Accreditation  
Council for Graduate Medical  
Education

**COCATS** = Core Cardiovascular  
Training Statement

**FIT** = fellow-in-training

**MMI** = multimodality imaging

**NAS** = Next Accreditation  
System

rapidly. Thus, our training needs must adapt to meet the new educational requirements necessary to maintain public trust in the delivery of high-quality patient care. This paper reviewed COCATS 4 from the perspective of FITs, those ensconced in training programs across the country. We examined the impact of COCATS 4 on the current training milieu, both for fellows and faculty; explored challenges and opportunities regarding implementation of these new guidelines; and

reflected on what COCATS 4 means for our patients, both now and in the future. This paper focuses on 3 primary themes: 1) evolution of training requirements in a competency-based curriculum; 2) development of novel learning paradigms such as bidirectional feedback; and 3) the establishment of task forces in emerging areas of cardiology (ie, multimodality imaging [MMI], critical care cardiology).

## EVOLUTION OF TRAINING

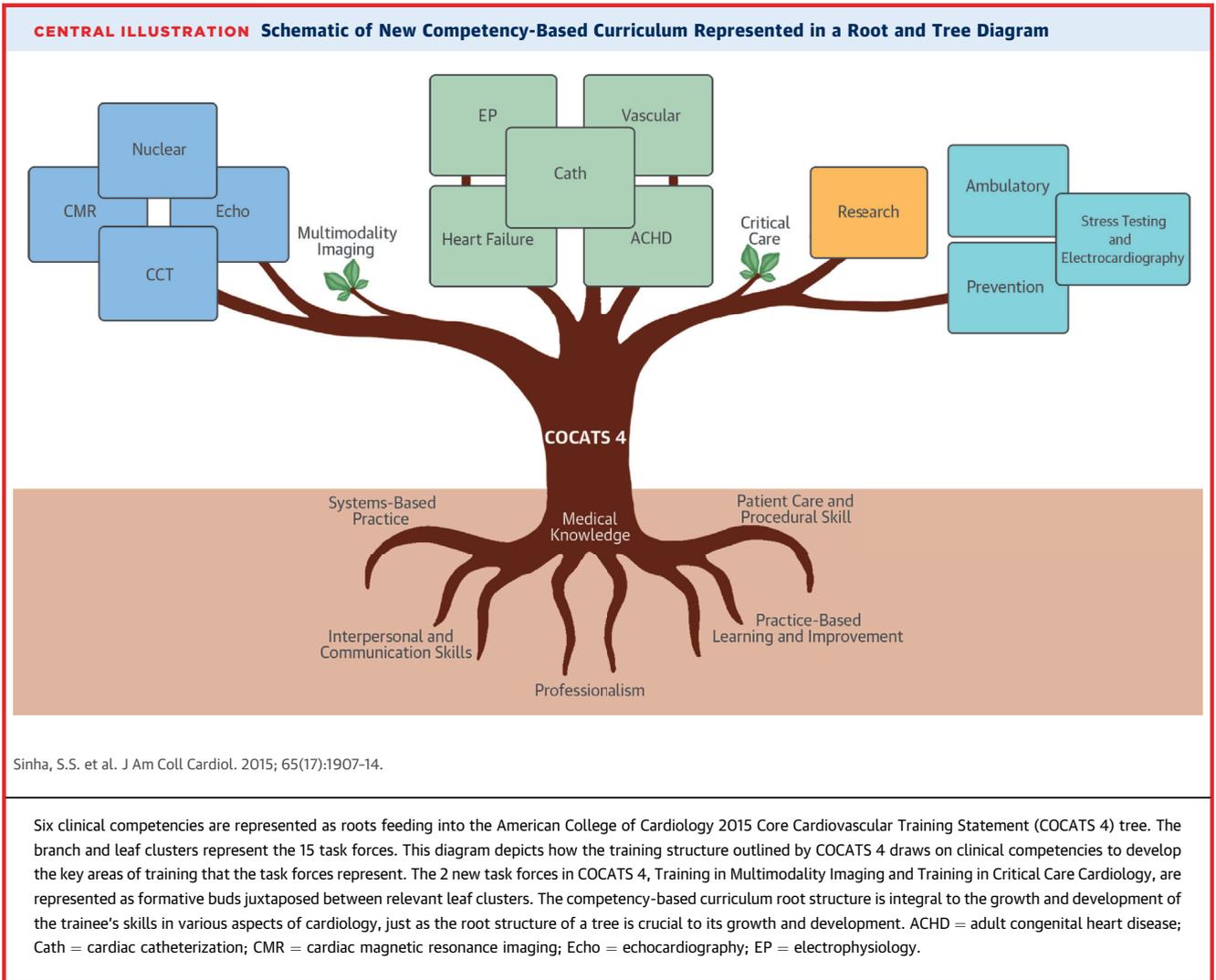
Several changes in COCATS 4 promise to enrich the cardiovascular fellowship training experience on multiple levels. COCATS 4 places a stronger emphasis on ambulatory, consultative, and longitudinal care, thus allowing FITs to develop long-term relationships with their patients at multiple points along the continuum of health and disease. In addition, COCATS 4 defines entrustable professional activities as “those activities that patients and the public expect all competent cardiologists can perform” (1). Specifically, these activities include competence in cardiovascular consultation, acute cardiac care, chronic cardiovascular disease management, cardiovascular testing, disease prevention and risk factor control, team-based care, and lifelong learning. These activities provide the framework on which the rest of cardiovascular education is built (10). Therefore, FITs must assimilate formative skills and experiences to achieve competence in these compulsory entrustable professional activities that will serve as the foundation for both their training and their career.

Most notably, COCATS 4 transitions to a competency-based curriculum with specific milestones that facilitate a pathway to independent practice (11). Milestones are defined as the “knowledge, skills, attitudes, and other attributes for each of the ACGME competencies that describe the development of competence from an early learner up to and beyond that expected for unsupervised practice” (12,13). In synergy with recent recommendations from the ACGME and the American Board of Internal Medicine, the American College of Cardiology has adopted this

format for its competency and training statements, career milestones, lifelong learning, and educational programs (1). The American College of Cardiology will also provide tools and evaluation instruments to evaluate trainees’ progress through the various curricular competencies, currently available in the form of ambulatory clinic, catheterization laboratory, and echocardiography mapping tools.

The current competency-based curriculum in COCATS 4 not only represents a shift in focus from minimal case volume and exposure time requirements but also underscores the emphasis on outcome-based evaluations, specific learner objectives, and bidirectional evaluations, in which both faculty and trainees mutually evaluate and provide constructive feedback to one another (14-19). COCATS 4 empowers programs and trainees to customize the fellowship experience. Depending on available resources, facilities, and trainee skills and aspirations, programs and trainees can now variably sequence their clinical rotations and educational opportunities. COCATS 4 provides FITs with a suitable avenue to seek guidance if they either exceed competency-based milestones or perform suboptimally, despite achieving minimal procedural requirements with respect to volume and/or time. In addition, COCATS 4 recognizes that some requirements, both with respect to volume and time, can be pursued concurrently (e.g., noninvasive MMI). This update is crucial for FITs because a 3-year general cardiology fellowship has a finite number of training months in which to achieve level I and/or II competencies. In this manner, COCATS 4 provides both the flexibility and structure for programs and trainees to adapt to a rapidly changing, constantly evolving discipline (**Central Illustration**).

In the spirit of competency-based evaluation, COCATS 4 now extends expectations for level II training well beyond maintenance of logbooks with respect to case volume and time. It formally proposes that a standardized benchmark, such as a certifying examination, be used to measure attainment of the requisite knowledge for level II training. COCATS 4 defines level II training as the minimum level of competency necessary to sit for these standardized assessments. As FITs prepare for these examinations, they will not only achieve content mastery at an intermediate skill level but also continue to cultivate the habits of lifelong learning. Importantly, COCATS 4 provides less detail about level III training requirements, but it recognizes that FITs desiring level III training will likely pursue a subspecialty board certification examination in their particular discipline. COCATS 4 promulgates that expert educators in



each specific subspecialty will develop Advanced Training Statements that delineate specific level III objectives for each area. Thus, COCATS 4 provides an overarching educational framework to inform and guide training for FITs in general cardiology fellowships. FITs pursuing subspecialty training will eagerly anticipate publication of the Advanced Training Statements in their particular fields to ascertain their exact curricular requirements.

**COMPETENCY-BASED CURRICULUM: THE NEXT FRONTIER?**

Many of the changes in COCATS 4 parallel development of the ACGME's Next Accreditation System (NAS) (11). NAS addresses public expectations for physician training. It stems from the philosophy that the 21st century physician should participate in a

team-based health care system, use information technology, practice cost-effective medicine, and function as a health care leader. With NAS, the ACGME sought to accomplish 3 missions: 1) to prepare physicians for team-based, cost-effective 21st century practice; 2) to accelerate the ACGME's movement toward outcome-based rather than time-based accreditation; and 3) to mitigate the burden of the structure and process-based approach to facilitate innovative learning paradigms.

COCATS 4 extends the principles of NAS to cardiovascular training programs. In 2011, the Carnegie Foundation for the Advancement of Teaching stated that standardization of progressive learning outcomes was 1 of the major steps necessary to transform graduate medical education (20). COCATS 4 achieves that aim: it outlines core competencies and curricular milestones for each task force in the domains of patient care, medical knowledge, professionalism,

interpersonal and communication skills, practiced-based learning and improvement, and systems-based practice. Thus, COCATS 4 endows FITs with a definitive outline of specific milestones needed to meet the demands of new accreditation paradigms.

Fundamental to any competency- and milestone-based training is the assessment of specific learner outcomes. For the 15 distinct task forces outlined in [Table 1](#), COCATS 4 clearly defines the 6 ACGME core competencies and outlines the specific curricular content and milestones. Milestones are divided into 12-month intervals over the 3-year general cardiology fellowship training. Evaluation tools such as self-reflection, in-training examinations, simulation, and direct observation are recommended. COCATS 4 provides FITs with well-defined milestone expectations for each of the 6 ACGME domains. The 36-month competency-based milestones provide a road map for FITs to track their educational progress and trajectory, identify areas of strength early in training, or seek timely assistance if they lag behind. This clear delineation of consistent curricular expectations will only enhance the educational environment for FITs. This emphasis in COCATS 4 will more effectively prepare FITs for unsupervised practice as they embrace lifelong learning and competency-based education. In some ways, COCATS 4 represents the culmination of the ACGME's efforts to empower training programs to define their strategic approach to NAS (21). Thus, COCATS 4 has an opportunity to lead the curricular innovation among internal medicine subspecialties.

#### **CRUCIAL CONVERSATIONS: BIDIRECTIONAL FEEDBACK AND EVALUATION**

Bidirectional feedback and evaluation hold prominent positions in the COCATS 4 document. COCATS 4 states, "An optimum training environment includes bidirectional evaluations, in which faculty evaluate and provide positive or negative feedback to trainees and trainees evaluate faculty" (1). This is certainly a laudable goal. However, difficulties with systematic implementation are sure to arise.

Multiple studies have documented the presence of a feedback gap in medical education (22,23). Learners consistently report not receiving feedback, despite faculty impressions that they provide feedback. For the principles from COCATS 4 to optimize the educational environment, teachers and learners across cardiovascular medicine need to close this feedback gap.

How can they accomplish this lofty proposition? From the perspective of faculty, they need to explicitly label feedback to trainees. For example, after

working together for a day in the cardiac catheterization laboratory, an attending physician might say to a first-year FIT, "I enjoyed working with you today. You safely and efficiently gained vascular access in all our cases, which is better than I would expect for colleagues at your level of training. I noticed you struggled a bit engaging the coronaries, particularly the right coronary artery, which I know can be tricky. Next steps in your learning include consistent engagement of the coronary arteries before dye injection. After that, we can work on engaging and injecting bypass grafts." Feedback such as this provides a timely, focused, specific, and behavioral-based assessment of a trainee's strengths, weaknesses, and areas for growth and development. It empowers learners to advance their educational stage and opens communication between senior faculty and more junior trainees for future conversations regarding educational objectives and curricular achievements.

COCATS 4 also stipulates that feedback needs to be bidirectional. In other words, FITs need a consistent, confidential, and reliable system through which they can provide feedback to their attending physicians. The hierarchical difference between academic faculty and FITs makes verbal face-to-face feedback difficult for FITs to provide. Many programs already have confidential feedback systems in which learners can provide frank assessments of their faculty's strengths and weaknesses. For COCATS 4 to meet its goals of consistent bidirectional feedback, all training programs need systems for providing confidential, formative feedback from trainees to faculty. Situations in which FITs repeatedly believe that their education is compromised by faculty who do not meet their learning needs should be addressed through faculty development or reassignment. Alternatively, faculty who continually demonstrate dedication to educational excellence need to be rewarded commensurate with their expertise.

Ultimately, the FIT community can benefit considerably from the emphasis on feedback in COCATS 4. However, systematically implementing these recommendations will require a long-term, concerted effort on behalf of the cardiovascular community to provide bidirectional, specific, and behavioral-based feedback.

#### **NEW TASK FORCES**

As with previous iterations, COCATS 4 reflects the culmination of several major substantive revisions, including the addition of 2 new task force reports. Although distinct task forces address the 4 major noninvasive imaging techniques (echocardiography, nuclear cardiology, cardiovascular computed

**TABLE 1 Summary of Key Points in COCATS 4 Task Forces Organized by ACGME Core Competencies**

	<b>Medical Knowledge</b>	<b>Patient Care and Procedural Skill</b>	<b>Systems-Based Practice</b>	<b>Practice-Based Learning and Improvement</b>	<b>Professionalism</b>	<b>Interpersonal and Communications Skills</b>	
1. Ambulatory, Consultative, and Longitudinal CV Care	Understand the presentation, contributing factors, and differential diagnosis of common cardiac symptoms	Manage CV patients appropriately in the outpatient setting	Utilize an interdisciplinary approach to assess appropriateness, feasibility, quality of care, and safety of treatment decisions for patients	Pursue opportunities to improve knowledge base of specific cardiac diseases	Demonstrate appropriate sensitivity to patient clinical and personal needs diagnosed with specific cardiac diseases  Practice within the scope of expertise and technical skills  Emphasize adherence to national guidelines and appropriate use criteria	Communicate effectively with patients and families regarding the presentation, test results, and treatment options for the specific CV disease  Communicate effectively with other health care professionals for optimal interdisciplinary care of the CV patient	
2. Prevention	Understand principles of preventative cardiology and disease states associated with CV pathology	Perform appropriate preventative CV screening					
3. ECG and ETT	Understand the physics and practical principles behind obtaining the cardiac imaging study or ECG  Interpret common CV diseases on cardiac imaging	Interpret normal and pathological changes on ECGs					
4. Multimodality Imaging		Appropriately order, perform, and identify CV pathology on CV imaging studies					
5. Echocardiography							
6. Nuclear							
7. Cardiac CT							
8. Cardiac MRI							
9. Vascular Medicine							Evaluate and manage common vascular conditions and perform vascular procedures
10. Catheterization							Perform cardiac catheterization procedures
11. Electrophysiology	Manage patients with arrhythmias and perform EP procedures						
12. Heart Failure	Interpret test results, manage disease states, and utilize appropriate treatment strategies in patients with specific cardiac disease						
13. Critical Care Cardiology							
14. Adult Congenital Heart Disease							
15. Research and Scholarly Activity	Understand fundamental principles of clinical and basic science research	Evaluate and utilize scientific concepts appropriately in clinical medicine					Understand role and use of institutional review boards and registry data

CT = computed tomography; CV = cardiovascular; ECG = electrocardiogram; EP = electrophysiology; ETT = exercise tolerance testing; MRI = magnetic resonance imaging.

tomography, and cardiac magnetic resonance), Task Force 4 combines these modalities into MMI. Training in MMI requires FITs to ascertain the necessary experience in each of these imaging modalities, to understand the strengths and limitations of each test, and learn how to choose “the right test for the right patient” (24). Although every cardiovascular FIT is expected to acquire level I training in all noninvasive imaging modalities, level II training in  $\geq 2$  imaging techniques typically requires additional training beyond the standard 3-year cardiovascular fellowship.

FITs, particularly those who are interested in a career in MMI, will certainly benefit from this important task force. Fellows will now have the opportunity to customize their imaging experience on the basis of their subspecialty aspirations. For instance, aspiring heart failure and transplantation fellows may wish to enhance their experience in echocardiography (1). Those interested in cardiac electrophysiology may wish to augment their understanding of nuclear cardiology, especially positron emission tomography myocardial perfusion imaging. Both heart failure and cardiac electrophysiology fellows may be interested in developing a deeper understanding of cardiac magnetic resonance imaging. Aspiring interventional cardiology fellows interested in structural heart disease and transcatheter aortic valve replacement may wish to dedicate elective time to transesophageal and 3-dimensional echocardiography.

Implementing this new task force will bring some challenges, however. Some training sites may not be able to provide exposure to all 4 imaging modalities. Thus, training programs should seek collaborations with off-site facilities to provide adequate exposure to those resources not available in their institutions. Furthermore, FITs must ask if training in multiple imaging modalities provides a truly optimal learning experience. On the one hand, familiarity with multiple modalities increases the versatility of skills one can offer to future patients and employers. On the other hand, trainees in MMI sacrifice depth for breadth, potentially limiting leadership and research opportunities that require dedicated focus to a single imaging field.

Last, noninvasive cardiovascular imaging modalities have become increasingly more expensive and complex. The impact of appropriate use criteria on the clinical practice of MMI remains to be determined. Studies will specifically need to establish whether Task Force 4 recommendations can lead to higher quality and more cost-effective care and more appropriate imaging utilization. Finally, the impact of Task Force 4 recommendations on influencing FITs to pursue careers in MMI remains uncertain.

COCATS 4 also adds a separate task force addressing critical care cardiology. Rapidly evolving technologies, such as complex percutaneous coronary intervention and mechanical circulatory support, have transformed modern cardiac intensive care units (ICUs). Cardiology training programs traditionally include cardiac critical care rotations as part of the clinical curriculum, although the type, duration, and degree of exposure vary considerably (25). To provide a more cohesive training experience, Task Force 13 defines the competencies relevant to critical care cardiology during standard 3-year clinical cardiology fellowship training. Level I training includes acquisition of knowledge and utilization of medications in the management of critically ill patients, development of skills to insert hemodynamic monitoring catheters at the bedside, recognition of indications for mechanical ventilation and renal replacement therapy, management of acute bleeding, and indications for mechanical circulatory support. Finally, understanding how and when to seek appropriate palliative care consultation and transition of care is necessary. It is important to note that while FITs can achieve level II training in specific areas during the 36 months of training in cardiovascular disease, there is currently no level II designation for critical care cardiology in COCATS 4.

Similar to other task forces, level III training requires additional education in critical care after completion of the general 3-year cardiology fellowship. However, the exact requirements for level III training will be published in a separate, forthcoming advanced training statement (1). Task Force 13 provides a unique opportunity for FITs to acquire procedural experience, build team leadership skills, and collaborate with multidisciplinary teams. Ultimately, FITs who choose a career in critical care cardiology will receive enhanced exposure to rotations throughout medical and surgical cardiac ICUs. This collaboration with other ICU team members, including cardiac surgeons, anesthesiologists, pharmacists, and nurses, will only enhance the depth and breadth of critical care training moving forward (26).

The development of critical care cardiology in COCATS 4 has its own potential barriers to implementation. For example, how should FITs who are interested in critical care cardiology structure their training? To what other traditional aspects of cardiology (e.g., imaging, heart failure, cardiac catheterization) should they receive exposure? How will formalized training pathways affect interactions between cardiologists and critical care specialists who come from a pulmonology or anesthesiology background, and how will this translate to the learning environment? Only time will tell.

## CONCLUSION: IMPACT OF COCATS 4 ON QUALITY OF TRAINING AND PATIENT CARE EXPERIENCE

The changes outlined in COCATS 4 are intended to result in higher quality training and ultimately improved patient care. The development of a competency-based curriculum, focus on bidirectional feedback, and the establishment of task forces on MMI and critical care cardiology allow for an enhanced and more nuanced training experience that should lead to greater trainee satisfaction.

The shift in focus to curricular competency milestones paves the way for training programs to tailor educational interventions to the needs of individual FITs. The majority of training programs will have trainees who vary in strengths and weaknesses. COCATS 4 outlines that “mechanisms should be incorporated so that fellows who perform suboptimally or exhibit critical deficiencies can be counseled and provided with opportunities for corrective action” (1). This shift dovetails with the implementation of bidirectional feedback systems that enable all parties to understand the metrics by which they are being evaluated. Thus, if implemented as outlined, the empowerment of FITs to tailor their experiences, in concert with training program leadership to best suit their individual educational needs, should result in greater satisfaction and quality in their training experiences. A timely, iterative bidirectional feedback process should strengthen deficient skill sets and motivate those performing at proficient levels to strive for excellence.

COCATS 4 promulgates our mission to deliver timely, safe, and effective patient care in cardiovascular disease (1). Patient care should especially benefit from the newly outlined and organized approach to training in critical care cardiology and MMI in COCATS 4. These new task forces bring standardization to training that has been greatly disparate and program-dependent until this point. After having trained in the COCATS 4 era, FITs looking for career opportunities in the burgeoning field of critical care cardiology will leave fellowship with a uniform set of skills. Moreover, patients and the health care system will benefit from a generation of cardiologists who are trained to select the appropriate imaging test for the appropriate clinical situation.

COCATS 4 presents several important challenges, which may, in fact, serve as opportunities in disguise. Smaller training programs may have limited time, financial resources, facilities, and personnel to effectively implement these changes. How will those programs not in compliance with COCATS 4

recommendations receive critical feedback to improve their adherence? What recourse and resources will be available to them? For instance, although COCATS 4 incorporates simulation-based learning opportunities in various task forces, it does not specifically address the potential utility of an eLearning platform, which could help remediate programs unable to meet training requirements. Such a platform using Web-based technology has been utilized successfully by the European Society of Cardiology to standardize cardiovascular training (27).

In addition, experienced senior faculty may share some reservations with respect to the competency-based curriculum, and they may also express reluctance regarding the implementation of timely, behavioral-based, and bidirectional feedback. How will faculty be encouraged to engage in academic discourse and participate in implementing these changes? Finally, duty hour restrictions and the emphasis on enhanced supervision (28) could limit the breadth and depth of clinical exposure and experience for cardiology FITs. Clinical service obligations may place greater demands on senior FITs to complete duties once performed by more junior trainees (i.e., internal medicine house officers), such as placement of arterial and central venous catheters in the cardiac ICU. This scenario may potentially limit the autonomy of interns and residents, while shifting the focus and priorities of FITs away from other important clinical rotations to facilitate their professional growth and development. These challenges are far from insurmountable. Instead, they represent unique opportunities to encourage further discourse. COCATS 4 embraces the spirit of continual transformation of training requirements to meet evolving clinical needs and initiatives. It thus enriches the cardiovascular fellowship training experience for patients, programs, and FITs alike. For these reasons, the COCATS 4 guidelines may prove to be the most influential recommendations yet.

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