



## COMMENTARY

# Multimodality Imaging Training for General and Advanced Cardiology Fellowships

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## Abstract

With the growth in multimodality imaging technology, there is heightened interest in advanced imaging training within the cardiology fellow community. The ideal training models for multimodality imaging remain to be determined and there are uncertainties about the manpower needs for cardiologists with advanced multimodality imaging expertise. This commentary discusses several areas pertaining to training of cardiology fellows in multimodality imaging.

**Keywords:** multimodality imaging; fellowship education; COCATS

## Introduction

Imaging plays a critical role in the diagnostic workup of cardiac patients. A wide array of imaging modalities available for clinical use and the emergence of stronger evidence supporting imaging in various cardiac diseases have helped in advancing the role of cardiac imaging. Consequently the present-day clinician has the option of using not only the traditional modalities of echocardiography and nuclear imaging but also newer technologies such as cardiac computed tomography (CCT) and cardiac magnetic resonance imaging (CMRI). The term *multimodality imaging* generally refers to the use of echocardiography, nuclear imaging,

CCT, and CMRI in combination in a clinical setting. When more than one modality is used in cardiac imaging, the synergy between techniques can result in greater diagnostic accuracy as well as more robust prognostic information.

In conjunction with the recent advances in imaging technology, a greater interest in cardiac imaging training has also emerged. Newer exciting applications of cardiac imaging in various diseases are being described, and there is a perceived absence of appropriately trained imaging experts in the current cardiology workforce. As a result, cardiology training programs are currently engaged in the development of new training paradigms in imaging through the launching of multimodality imaging fellowships. Multimodality imaging training provides instruction simultaneously in several areas, such as echocardiography, nuclear cardiology, CCT, and CMRI, with the goal of certification in several areas during either traditional general cardiology fellowship or an additional year(s) of specialized advanced fellowships. This article reviews several aspects of multimodality imaging training for cardiology fellows.

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## Standard Setting for Cardiology Fellowship Education in the United States

The Core Cardiology Training Statement (also referred to as *COCATS*) developed under the auspices of the American College of Cardiology (ACC) sets the standards for the cardiovascular fellowship curriculum and defines the competences for cardiovascular training in the United States [1]. The latest recommendations from *COCATS* for general cardiology fellowship training were published in 2015. *COCATS* describes three levels of attainable proficiencies for each area of cardiology training: level I (minimum exposure and knowledge), level II (intermediate level of expertise, ability to engage in unsupervised practice), and level III (advanced skills, including the ability to train others and direct a laboratory). It is important to note that level I training refers to only limited exposure and knowledge required of all cardiologists, and does not indicate competency for certification at a level for independent practice.

The Accreditation Council for Graduate Medical Education (ACGME), on the other hand, is tasked with promulgating the general standards for cardiology fellowship training (both institutional and program specific) and accrediting training programs in the United States. ACGME generally does not define the fellowship curriculum or procedure numbers for cardiology training, unlike *COCATS*.

The recommended number of studies to be performed and interpreted for different levels of echocardiography training are given in *COCATS* [1]. Also provided are similar numbers for the other imaging modalities. These numbers are based on expert opinion, and there are no well-studied data to support the recommendations of the required procedure numbers. Since the pace and trajectory of the learning curve is learner dependent, the rigid application of rules regarding procedure numbers in echocardiography has become a source of anxiety and concern for many fellows in training. Similar critique has been advanced against the required number of studies in CCT and CMRI since these numbers are based on the opinion of leaders in the field.

Another recent debate centers on the ability of a fellow to train at level III in any of the imaging modalities (e.g., echocardiography)

during 36 months of a general cardiology fellowship. A document pertaining to level III echocardiography training during general fellowship is expected this year.

It is common for most current general cardiology fellows to want training and certification at level II in multiple imaging modalities during their general cardiology fellowship training. It is likely that most fellows perceive level II imaging training enhances their job prospects; however, this perception may not be based on evidence from the field. We do not know how the skills of the multimodality imager are used in the nonacademic setting. While echocardiography and nuclear cardiology are the level II certifications most commonly sought, many training programs are also able to certify their fellows in CCT within a 3-year fellowship training. Some fellows planning advanced training in interventional cardiology, clinical electrophysiology, and advanced heart failure and transplantation are also interested in level II certification in imaging. The *COCATS* requirements for several clinical and laboratory experiences during 36 months of general cardiology fellowship pose unique challenges for the creation of fellow schedules that satisfy certification standards in multiple imaging domains. These limitations become more relevant when a 3-year training program mandates 12 months of dedicated research.

## Current Challenges Facing Cardiac Imaging in the United States

At present, several challenges are being anticipated and/or tackled in the cardiac imaging field. These have been nicely summarized by the think tank convened by ACC in 2015 [2]. With the focus shifting from volume to value, the field of cardiac imaging has to rethink several aspects of imaging to promote continued growth of the field. Unlike therapeutic interventions, imaging modalities have a more difficult task of demonstrating positive outcomes. Moreover, the imaging societies have by and large remained independent of each other in developing recommendations for the use of the various imaging modalities in various diseases. The emerging view regarding “patient-centric” imaging [2] is highly relevant not only to provide cost-effective

and high-value patient care but also in defining the future models for advanced multimodality cardiac imaging training. As the leaders in cardiology fellowship education develop newer paradigms for imaging training, it will be important to incorporate the aforementioned principles in their recommendations. Combined efforts of the various imaging societies will be essential for the development of recommendations based on high-value care as well as incorporation of patient-centric imaging principles in fellowship education.

### **Current Job Market for Cardiologists with Advanced Multimodality Cardiac Imaging Training**

One of the responsibilities of fellowship program directors and faculty mentors is to provide thoughtful and honest career advice to fellows. At present, there are very few actual data regarding the job market for cardiologists with imaging training. Because of this, a program director is at a disadvantage when providing meaningful career advice to fellows. Limited data from imaging training program directors seem to indicate that many cardiologists with advanced imaging training are asked to provide significant clinical care and their imaging practices are predominantly limited to one or two modalities [3, 4]. It is critical that we have reliable data from recent graduates from advanced imaging fellowship programs regarding the current state of the job market and the opportunities to engage in CCT and CMRI work. These data would also need to be collected yearly to keep pace with the changing dynamics of the workplace in the United States. The ACC's Imaging Section Leadership Council is currently developing a comprehensive survey to better understand the job placement data of imaging trainees.

### **The Silo Effect in Cardiovascular Imaging and Its Negative Ramifications for Fellowship Training**

At present, the training standards and certifying examinations for multimodality cardiac imaging

are controlled by multiple imaging societies. The financial burden of separate certifying examinations for each modality of cardiac imaging (echocardiography, nuclear cardiology, CCT, and CMRI) is daunting to most fellows. Many fellows sit for several imaging examinations in addition to the qualifying examination in cardiovascular diseases (from the American Board of Internal Medicine). The time and expense involved in preparing for these multiple certifying examinations have been a long-standing concern for the cardiology fellow community. Moreover, the independent functioning of the imaging societies could produce disparate recommendations for expensive technologies that do not foster thoughtful stewardship of health care dollars, particularly at a time when the health care system is being evaluated on the basis of value and not volume. Finally, the silo effect has adverse consequences for a multimodality training program design and the potential to lengthen the duration of fellowship training.

### **Areas Requiring Action**

1. Develop standard pathways for advanced cardiac imaging training.  
At present, there is significant variation in the structure of fellow rotations, institutional ownership of imaging services for CCT and CMRI (radiology versus cardiology), and the mix of imaging training obtained during imaging fellowships [5]. Harmonious collaboration between radiology and cardiology departments will be critical for provision of high-quality CCT and CMRI training to fellows in many centers. The benefits accrued through such collaboration between cardiology and radiology departments for clinical services as well as education have been discussed [5]. At the national level, the various imaging societies should partner and work harmoniously to streamline the training requirements and certification in cardiac imaging.
2. Maintain a current and comprehensive list of advanced multimodality training programs available to cardiology fellows and program directors. Such a list exists currently within the Imaging Section pages of the ACC website. All such data need to be updated yearly.

3. Create an updated list of where recent advanced imaging trainees found employment and how their training is being utilized.

Such data would be integral to fellows pursuing cardiac imaging training and their mentors in planning posttraining employment. The data also need to be current and housed appropriately for easy access by all stakeholders.

4. Simplify the certification process for various modalities of cardiac imaging through collaborative work between the imaging societies and work toward a single certification examination.

## Conclusion

Multimodality cardiac imaging training is currently experiencing a high level of interest from

cardiology fellows nationally. Our profession needs to work toward creating a training track for imaging that is in step with the changed paradigm of focus on value instead of volume. This requires training that is patient-centric rather than technology-centric. More data on training opportunities and the job market for imaging cardiologists are essential for fellows seeking training in imaging and their mentors. A simplified examination process in contrast to the current system of multiple examinations for different imaging modalities should be developed to reduce the burden on fellows.

## Conflict of Interest

The author declares no conflicts of interest.

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