

The Multimodality Imager: Reality or Fantasy?

IMPROVEMENTS IN EXISTING TECHNIQUES such as echocardiography and nuclear medicine and new technologies such as computed tomography and magnetic resonance imaging have changed the face of cardiovascular imaging in just a few short years. But how do we ensure that we have the right workforce to properly perform these new imaging modalities, to appropriately deploy them in clinical care, to advance knowledge in these new fields, and to train the next generation? The answer is often the development of a new breed of cardiologist, the “multimodality imager.” Although catchy, its precise definition remains unclear, as does the pathway to achieving this title through training, as well as implementing it in practice.

The European Society of Cardiology’s imaging associations called this the “Future of Imaging” (1) and articulated the following vision for future imagers:

- future diagnostic specialists should be trained in several imaging modalities;
- experts in different imaging modalities should collaborate, not compete;
- joint clinical services and common diagnostic pathways should be developed; and
- expertise in imaging should be encouraged and funded as an integral component of basic, epidemiological, and clinical collaborative research networks.

Others have questioned what such a vision might mean for the average cardiologist who performs echocardiography and perhaps nuclear interpretations in the course of providing clinical

CATS) recommendations, or who are enrolled in fellowships in which training in these techniques is simply not available. These questions are not yet fully answered.

We invited imaging experts to comment on the concept of the multimodality imager and how this will change their own and their institutions’ approaches to imaging. Dr. Beller will discuss his innovative proposal to training, which is designed to achieve multimodality expertise, and Drs. Auseon and Ryan will present a clear-eyed view of the possible hurdles ahead for the multimodality practitioner. What do they have to say? Would you share your opinion with us? We encourage you to visit *iNEWS* on CardioSource and tell us what you think by using its “Talk-Back” feature. The opinions presented herein are entirely of the authors and do not

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care and who depends on these techniques for decision-making, income, and good patient service, or for the single-modality experts, who now lead most of our academic programs. Or, for that matter, for current trainees who simply cannot fit in the 30+ months it would take to train in all modalities according to current Core Cardiology Training Symposium (i.e., CO-

reflect or express the position of American College of Cardiology, *JACC: Cardiovascular Imaging*, or the editors.

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Multimodality Imaging Is a Reality...

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I HAVE PROPOSED AN ADVANCED CARDIOVASCULAR IMAGING TRAINING TRACK to address the desires of some cardiology fellows interested in emphasizing cardiovascular imaging as a subspecialty in their professional careers (2,3). In addition to the long-standing traditional cardiac imaging disciplines of echocardiography and nuclear cardiology, they sought to become proficient in the emerging new technologies of cardiac computed tomography (CCT) and cardiac magnetic resonance imaging (CMR) and new molecular imaging approaches that were aimed at the in vivo assessment of biologic processes of the heart and vascular system.

In our current training paradigm, fellows rotate to individual silos of imaging technologies, and it is rare to see noninvasive multimodality imaging conferences or didactic lectures by topics that are comprehensive, for instance, viability assessment and the detection of coronary artery disease. Few fellows are able to acquire advanced Level 3 training in more than one imaging modality because of the time commitment required. I proposed a new training paradigm of 2 years of advanced imaging training, shortening the cumulative months for all 4 imaging modalities and adding an innovative curriculum. The individual silos designated for separate months of additive training would be eliminated, modalities would be learned concurrently, and the didactic curric-

ulum transformed with input from all the clinical imaging experts as well as physicists, experts in imaging processing, and the like. With 2 years dedicated to cardiovascular imaging training, added to the 7 months of noninvasive training included in the standard 2 years of training in clinical cardiology (4), fellows could attain Level 3 training in 2 and perhaps 3 of imaging modalities. Those fellows interested in pursuing an academic career who needed additional research training might take an extra year with emphasis in one or perhaps 2 major area of imaging research with the goal of ultimately applying for a K08 or K23 National Institutes of Health grant award.

With this new paradigm, a fourth year of training devoted solely to advanced imaging training could become a requirement for a board examination leading to a Certificate of Added Qualification (CAQ) under the aegis of the Cardiovascular Board of the American

at this time is that a limited number of training programs now offer advanced training in CMR and CCT.

At the University of Virginia, we have created such a multimodality imaging track. It comprises 2 years of dedicated training in cardiovascular imaging, including clinical and research components, and is funded by a National Institutes of Health T-32 training grant. To date, one of the imaging fellows has fulfilled Level 3 training in CMR, CCT, and nuclear cardiology, and 3 have attained Level 3 in CMR and CCT with Level 2 "plus" in nuclear cardiology and echocardiography. Two more fellows who currently are in training should attain Level 3 in 3 of the modalities. One major contributing factor to their success in advanced training relates to their clinical research projects that used multimodality imaging.

Thus, with the great strides made in the field of cardiovascular imaging

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Board of Internal Medicine, which is similar to what evolved for the subspecialties of interventional cardiology and clinical electrophysiology. This new certification would not preclude general cardiologists with standard Cardiovascular Board certification, who have Level 2 training in several imaging modalities, from continuing to engage in their noninvasive practices. Also, noninvasive cardiologists who already are competent in multiple imaging techniques would become eligible to sit for such a CAQ examination ("grandfathering"). The problem with pushing for a full subspecialty board

in the past decade, the time has come to introduce new pathways for training emphasizing the multimodality approach and providing for advanced imaging training in 4 or 5 years of total fellowship training, perhaps someday leading to a new subspecialty board CAQ by the American Board of Internal Medicine (ABIM). We need to eliminate the silos of training in each technology and move to a more integrated approach that uses multimodality imaging training for all cardiology trainees, not just those interested in imaging as their major area of expertise.

Can We Realize It in Clinical Practice?

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ALTHOUGH MANY AGREE THAT THE ERA OF THE MULTIMODALITY IMAGER IS UPON US, what constitutes “expertise” and how it is acquired and maintained remain unclear. Viewpoints have been published in the context of imaging practice and reimbursement, as well as proper training requirements (5,2). Most of these viewpoints articulate a clear understanding of the current state of cardiovascular imaging and acknowledge that the multimodality paradigm is the future—yet no one knows how we are going to realize it in clinical practice.

Those cardiologists involved in the current iteration of multimodality imaging understand its limitations. Although a multimodality imager might be ideally suited to “choose the best test for the clinical scenario,” the precise definition of this new breed of clinicians remains uncertain. For some, it includes a working clinical knowledge of 2 imaging technologies and only a familiarity with the rest. For others, it means true technical and clinical expertise in all 4 modalities. Even if one is able to develop the ability to competently perform and interpret echocardiograms, nuclear stress imaging, CMR and CCT, there is no agreement on the amount of time one should devote to each modality to be truly proficient. Because this definition has proved elusive, outlining precise training requirements is challenging.

As with many new ideas, moving from concept to implementation has been difficult. Several practical issues must be addressed. Membership in the American Society of Echocardiography and the American Society of Nuclear Cardiology, (each with potential fellowship status: FASE and FASNC) currently costs a total of \$820 annually. In addition, each society publishes a journal with an average monthly total of 314 pages, filled with new information that is considered required reading for an imaging specialist in that field. Demonstration of special competency in cardiovascular imaging is fragmented, with “board” testing offered separately in nuclear cardiology and echocardiography and an inaugural examination in CCT slated for this year.

Thus, in the near future, for the multimodality imager to be fully “certified,” he/she must pass 3 additional tests beyond the ABIM examination in cardiovascular disease, costing a total of \$2,685 and each requiring recertification every 10 years. By way of comparison, the ABIM examinations for interventional cardiology and electrophysiology each cost \$2,000. These

CMR/CCT require between 90 h and 140 h of continuing medical education in aggregate every 3 years—3- to 4-fold that of the other subspecialty sections (6–8), and very close to the overall continuing medical education requirement in many states of 150 h/3 year.

For the multimodality imager concept to become a reality, there is much work to be done. Aside from the practical limitations described herein, the fundamental question of expertise must also be considered. Who do you want to interpret your imaging study, a dedicated expert in that modality or a versatile multimodality imager? This question is not unlike the endless debate about generalists and specialists—which one is better suited to care for a given patient? Perhaps the answer will also be similar, i.e., that there is a role for each. The single-modality imager will serve as teacher, thought leader, champion, researcher, and trailblazer, and a new generation of dedicated multimodality professionals will provide balance, appropriateness, and clinical judgment. The hope is that they will work together to keep the field of cardiovascular imaging exciting, productive, and valuable to our patients.

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costs do not include the optional attendance of multiple board review courses or purchase of review materials. Maintaining competency poses similar challenges. The American College of Cardiology/American Heart Association/American College of Physicians clinical use and competency statements in nuclear cardiology, echocardiography, and

Author Disclosures

Dr. Douglas holds Stock <\$10,000 in Northpoint Domain; has done research for Astron, Atritech, Edwards, Reata, and United Health Care; is a consultant for Genentech and Northpoint Domain; and has Board memberships for the American College of Cardiology and the American Society of Echocardiography (non voting).

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