

## IMAGING COUNCIL CHAIRMAN'S PAGE

## Multimodality Imaging: Opportunities and Challenges

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As the chair of the Cardiovascular Imaging Section, I recently asked the members of the Imaging Council to consider multimodality imaging: its definition and application and the opportunities for tomorrow. The Council is composed of representatives from the American College of Cardiology, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the Society for Cardiovascular Angiography and Interventions, the Society for Cardiovascular Magnetic Resonance, and the Society of Cardiovascular Computed Tomography, as well as a pediatric and adult congenital representative, each representing subspecialty imaging perspectives. Since the Council's inception, members have been focused on the importance of approaching cardiovascular imaging with a multimodality approach and emphasizing the concept of the "right test for the right patient" as a cornerstone of the American College of Cardiology's patient-centered activities. The discourse sparked by this inquiry—of what multimodality imaging is, how it is used today, and where it is going tomorrow—helped broaden my view of the opportunities and challenges that lay ahead for multimodality imaging.

The Imaging Council was in agreement that multimodality imaging is the efficient integration of various methods of cardiovascular imaging to improve the ability to diagnose, guide therapy, or predict outcomes. Most imaging modalities are currently used individually, forcing clinicians to choose the single best imaging approach for the situation. To be successful, one must have knowledge of the strengths and weaknesses of each imaging modality to know which is ideal for any given clinical situation. Because imaging tests are frequently performed in sequence, we sometimes find ourselves ordering a second

imaging test when the first approach did not provide all the information sought. However, the effective practice of multimodality imaging is the ability to identify the best imaging modality for a given clinical scenario, thus reducing the need for multiple or layered imaging.

## CHALLENGES

Among the greatest challenges is the rapid development and technologic advances of imaging. Within the span of 10 to 15 years, we have seen an enormous growth of imaging capacity. With these technologic advances, subspecialty expertise was necessary. Unintended consequences include: 1) the development of silos of imagers; and 2) increased demands to master the imaging expertise.

The development of imaging silos can result in an institution's investing in an imaging expert who develops only 1 imaging area but neglects other complementary imaging modalities. How often do we hear that we use a particular imaging approach because that is what is available (implying that an alternative imaging approach is not available)?

The increased demands to master imaging are evident in the increased number of fellows seeking training in more than 1 imaging modality. Unfortunately, the requirements for training in 1 imaging modality rarely have overlap with the requirements of another. Trainees often are faced with a choice between an academic focus on 1 modality versus broad-based training in multiple modalities. While we make multimodality training more difficult, the ability to apply "the right test for the right patient" becomes harder without training in multiple modalities. As cardiovascular imagers, we need to be proactive about promoting additional *effective* multimodality training programs and opportunities, for fellows and for current imagers in practice. Furthermore, credentialing and maintenance of certification requirements are currently modality specific and onerous for physicians providing clinical services in multiple modalities.

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Another challenge of cardiovascular imaging is the presence of various nonmedical factors, which ultimately may influence which modalities are used. Availability, cost, ownership, education, and personal bias may influence imaging selection rather than using only medical relevance. Although these circumstances are all the reality of the environment we practice in today, it is critical that we move to an efficient, purely patient-centered approach that considers only what is best for the patient.

## OPPORTUNITIES

**Technology.** Although technological developments, and the professional requirements that have come with them, have driven some of us apart, there is now the opportunity for them to pull us together. Fusion (or hybrid) imaging literally combines different imaging approaches into a single image. We currently have fusion of computed tomography (CT) and positron emission tomography, magnetic resonance imaging and CT, echocardiography and fluoroscopy, and more. These fused images will force the house of cardiovascular imaging to come together and will require combined expertise to overcome the limitations of collecting information 1 modality at a time. This technologic advance will also allow us to collect information in a less invasive manner than is currently available. Just think of the physiologic information we currently obtain with magnetic resonance imaging, CT, positron emission tomography, nuclear imaging, and echocardiography that would have required an invasive approach just a decade ago.

**Patient-Centered Imaging.** A patient-centered approach to medicine is quickly going to become a requirement for all clinicians, regardless of specialty. Cardiovascular imaging will be no exception. Patients, payers, and regulators will expect it, and we will need to deliver. Developing imaging “pathways” for different clinical scenarios, which would clearly identify the most effective and efficient modalities, could be extraordinarily helpful tools in determining the right test for the right patient. Broad-spectrum imaging expertise and technologic advances will make this approach more feasible than it is today. Better integration and understanding of the clinical applications of different modalities and how they complement each other will help elucidate the most cost effective and highest diagnostically accurate algorithms for patient care.

**Comparative Effectiveness.** As the national health care economic environment becomes more demanding, there will be a greater need for research designed to inform health care decisions by providing evidence of the effectiveness, benefits, and harms of different treatment options. This has garnered the growth and importance of “comparative effectiveness” research. This will apply to imaging, as in other aspects of medicine. It will likely open up great avenues of research for young clinician scientists and, more important, help ensure that patients are evaluated and managed in the most effective and efficient manner. The true value of imaging will emerge in a cost-effective, value-driven environment.

**Image-Guided Therapy.** Imaging and therapeutic interventions will likely become more closely connected and will help drive multimodality approach. This is evident in the rapid growth of transcatheter aortic valve replacement, for which echocardiographers are spending more time in the catheterization laboratory working side by side with their interventional colleagues. Currently, highly trained interventional cardiologists need to coordinate their implantation with information from the highly trained cardiologists in CT and echocardiography. This need is driving approaches to combine echocardiographic and computed tomographic images with fluoroscopy. We will see similar efforts with mitral interventions, electrophysiologic interventions, and heart failure therapeutics, in which procedures are guided by advanced imaging.

One of the roles of the Imaging Council is to serve as an advisory body and inform the American College of Cardiology Board of Trustees regarding imaging issues, policies, and developments that warrant the College's attention. The Council, with the assistance of Cardiovascular Imaging Section members, is beginning to explore “cardiovascular imaging in 2020.” Member discussions on this topic are ongoing along with suggested approaches. Whatever activities the Council and Section ultimately engage in will certainly consider the challenges and opportunities of using a multimodality approach to cardiovascular imaging.

For more information on the Cardiovascular Imaging Section, please visit [cardiosource.org/imaging](http://cardiosource.org/imaging). Interested in getting involved? Please e-mail [imagingsection@acc.org](mailto:imagingsection@acc.org) with your interests and background on your expertise.