The Cardiovascular Imaging Section, governed by the Imaging Council, within the American College of Cardiology (ACC) serves as a forum for all ACC members interested and involved in cardiovascular imaging. Unlike the individual imaging subspecialty societies that represent single imaging modalities, the council is composed of representatives from the societies and endeavors to view the field of imaging not as multiple individual silos but as a continuum of imaging options that can be applied selectively, or in combination, depending on the clinical questions being asked. Regardless of which modality is used, the individual’s skill in supervising the process and interpreting the images is of paramount importance. The Imaging Council has been a strong advocate for physician certification as a means to improve quality and patient care. Certification of imaging physicians has evolved and is now at a crossroads. The number of examinations being administered has rapidly increased, and the current fellows in training and early-career cardiologists wishing to have multimodality practices face the challenge of several overlapping and uncoordinated examinations and certifications. In this column, we review the history of the cardiovascular imaging boards, how things are changing in the practice of imaging, and where we need to go in the future.

CARDIOVASCULAR IMAGING PHYSICIAN CERTIFICATION: HOW DID WE GET HERE?

In the early days of cardiology, noninvasive imaging was very limited, and anyone with credentials as a cardiologist generally performed and interpreted imaging studies. With the development and widespread use of echocardiography, this practice continued, and anyone with board certification in cardiovascular diseases from the American Board of Internal Medicine (ABIM) was generally considered adequately trained, credentialed by hospitals, and accepted by payers to perform and interpret studies. Office-based imaging facilities had even fewer requirements, and a substantial number of inpatient and outpatient echocardiograms were being interpreted by noncardiologists. With the development and widespread clinical utilization of nuclear cardiology, it became essential to document training and experience of cardiologists for them to meet the Nuclear Regulatory Commission and agreement state requirements to become authorized users of radioactive materials. Unfortunately, this documentation only evaluated exposure to technical information and safety and did not assess competence in image interpretation and application of the results to patient management. For both echocardiography and nuclear cardiology, it became apparent that training and clinical competence in interpretation varied widely among practitioners and that institutional credentialing in itself did not guarantee quality.

Recognizing the variability in cardiovascular imaging quality, in the late 1980s and early 1990s, professional medical societies such as the ACC, the American Society of Echocardiography (ASE), and the American Society of Nuclear Cardiology (ASNC) began to define training and experience requirements, establish standards for interpretation, and document minimal standards for imaging practitioners. Not all practitioners supported these efforts. Many saw this as an attempt to restrict their clinical practice and income. The professional organizations engaged the ABIM in discussions to establish examinations in echocardiography and nuclear cardiology within the existing American Board of Medical Specialties (ABMS), which had widespread recognition in the area of physician...
credentialing. These efforts were unproductive, as the ABIM and ABMS required a minimum of 12 months of training beyond general cardiology to even consider developing a separate examination in what they perceived as an area of narrow and limited clinical knowledge. Because training and experience in echocardiography and nuclear cardiology were defined and acquired as part of general cardiology training, there were limited advance training programs in these modalities, and few cardiologists were willing to undertake an additional year of training exclusively in imaging. Eventually, 1-year to 2-year training programs in interventional cardiology, clinical cardiac electrophysiology, and advanced heart failure and transplantation cardiology were established, and these areas developed ABIM examinations.

Although a growing number of 1-year to 2-year cardiovascular imaging programs are now available, there were and are several reasons certification in a subspecialty area such as cardiovascular imaging will unlikely occur under the ABIM. This is due in large part to governance within the ABMS, which consists of 24 equal medical specialty boards.

1. It is expensive to develop and administer an examination for the relatively small number of imaging examination takers.

2. Many of the member boards, including the influential American Board of Radiology (ABR), have traditionally been against splitting knowledge areas for credentialing into smaller and smaller segments. ABMS member boards insist that certification by their boards allows diplomates to perform all activities evaluated within the examination, no matter how minimal the testing.

3. The ABR and the American Board of Nuclear Medicine in the 1990s believed that coronary angiography, echocardiography, and nuclear cardiology were covered in their examinations, and within the ABMS governance structure, they can block and have blocked separate testing by any other board in these areas. The ABR has taken this same approach to the newer imaging areas of cardiac computed tomography and magnetic resonance.

It was within this environment that the ASE and ASNC in the 1990s (and more recently the Society of Cardiovascular Computed Tomography and the Society for Cardiovascular Magnetic Resonance, in conjunction with the ACC) sought to independently develop non-ABMS physician certification boards. These so-called rogue boards were developed recognizing the importance of setting standards for training, as reflected in the professional medical society eligibility requirements, and having physicians document minimal competency by passing a standard examination. The belief of these professional societies was that such an approach would improve overall cardiovascular imaging quality and ultimately improve patient care. To that end, these “rogue boards” independently developed a set of basic guiding principles for examination development synonymous with the ABIM approach:

1. A separation needed to exist between the professional medical societies and the administration of the boards. The professional societies represent physicians and are involved in education and training. Although they initially assisted in starting the boards, the boards needed to have independence in developing the testing material and administering the examinations. This was essential to avoid the appearance that the organizations representing the test takers (and instrumental in education and training) were merely “rubber stamping” their members’ certification.

2. Training and experience requirements established by professional medical societies were used to set eligibility criteria, and those meeting such criteria, even if they were not cardiologists, were allowed to sit for the examinations.

3. The knowledge areas, content, and relative percent of material to be tested were identified through a rigorous method of practice analysis. The goal was to test not for esoteric knowledge but for practical and standard clinical practice.

4. Content and knowledge areas of testing needed to be periodically sampled and updated on the basis of the development of technology and clinical practice. This is usually performed every 5 years.

5. Test question development and performance were governed by strong psychometric methods. ABIM has reviewed the examination processes of the imaging boards and judged them to be rigorous.

6. Testing should approximate clinical practice as much as possible. Examinations were initially given using paper-and-pen methods because of a lack of workstation-style testing methods. Echocardiography experimented with video methods, and recently, all examinations have converted to computer-based testing, which closely approximates clinical practice.
7. Ongoing maintenance of competence and recertification after 10 years are critical to maintain imaging physician skills.

As a result of this process, examinations were developed in echocardiography, nuclear cardiology, and cardiac CT. A brief history is presented below for each of the 3 existing boards: the National Board of Echocardiography (NBE), Certification Board of Nuclear Cardiology (CBNC), and the Certification Board of Cardiovascular Computed Tomography (CBCCT). The emphasis for each board will be to show how far we have come, the direction we need to take to remain relevant, and the need to evolve to multimodality cardiovascular imaging testing.

THE NATIONAL BOARD OF ECHOCARDIOGRAPHY

The first examination in clinical echocardiography was given in 1995 by the ASE as a “field test” and in 1996 as an examination of “special competence.” A body separate from the ASE, ASEeXAM, Inc., was created and administered the examination in 1997 and 1998. The Society of Cardiovascular Anesthesiologists also developed and administered an examination in echocardiography in 1998. Later that year, these 2 organizations merged to form the NBE, which has been offering yearly examinations since 1999. Adult and pediatric cardiologists and anesthesiologists are the majority of test takers. Initially, those taking the examination were primarily those directing clinical or research echocardiography laboratories, but in recent years, an increasing number of office and hospital clinical readers are taking the examination as credentialing bodies in hospitals and payers recommend or require physician certification.

Currently, the NBE offers the following examinations, which are listed with their complex abbreviations and the dates they were first given:

1. Examination and Recertification of Special Competence in Adult Echocardiography (ASCeXAM [1996] and ReASCE [2005])
2. Examination and Recertification of Special Competence in Advanced Perioperative Transesophageal Echocardiography (PTEeXAM [1998] and RePTE [2007])
3. Examination of Special Competence in Basic Perioperative Transesophageal Echocardiography (Basic PTE [2010])

Through 2013, a total of 10,150 applicants have taken the adult echocardiography exam, with a mean passing rate of 69%, and there are a total of 7,013 diplomates. Since 2005, a total of 1,005 applicants have sought recertification, and the passing rate has been 93%.

THE CERTIFICATION BOARD OF NUCLEAR CARDIOLOGY

In comparison with the complicated history of the NBE, the CBNC was established by the ASNC and ACC as an independent organization to develop and administer an examination in nuclear cardiology. Recognizing that radiologists and nuclear medicine physicians are also involved in the field, invitations were sent to the American College of Radiology and the Society of Nuclear Medicine, but they declined participation. The first examination was given in 1996. Because the eligibility criteria were consistent with the training and experience requirements of the Nuclear Regulatory Commission, CBNC certification was accepted as proof of meeting “authorized user” criteria for radioactive materials by the Nuclear Regulatory Commission. Previously such recognition was given only to ABR and American Board of Nuclear Medicine certification. This acceptance made it much easier for CBNC diplomates to obtain hospital privileges and to operate outpatient imaging facilities performing nuclear cardiology. Through 2012, there are a total of 7,629 diplomates and 557 testamurs: fellows in training who passed the examination and will become diplomates once they pass a primary ABMS board examination.

CERTIFICATION BOARD OF CARDIOVASCULAR COMPUTED TOMOGRAPHY

With the development and availability of multidetector computed tomographic systems, the field of cardiovascular computed tomography became possible in the 2000s. Cardiologists and radiologists were the main practitioners, and training and experience requirements were separately developed. The ACC, ASNC, SCCT, and Society for Cardiovascular Angiography and Interventions represented physicians with interest and involvement in cardiovascular computed tomography and organized to develop an examination. Invitations for participation were sent to involved professional medical organizations, including the American College of Radiology, but they declined participation. Similar to the development of the CBNC, these organizations used professional medical society recommendations for
training and experience and defined the scope of clinical practice by surveys. They formed the independent CBCCT to evaluate minimal competence. The first examination was given in 2008 on computer workstations. Through 2012, there are a total of 1,853 diplomates and 86 testamurs. 

SUCCESS OF THE SUBSPECIALTY IMAGING BOARDS

The NBE and CBNC are approaching 20 years of existence. If success is judged in numbers, the NBE, CBNC, and CBCCT have separately tested and certified a large number of physicians practicing in academic and community hospitals as well as in private practice. If success is measured in adoption and recognition, diplomates have been recognized by institutional credentialing bodies, payers, regulatory agencies, and imaging laboratory accrediting bodies. CBCCT certification and CBNC certification and recertification examinations have been accepted for 20 points (each) of credit in the self-evaluation of medical knowledge requirements in the ABIM's maintenance of certification program. The NBE has applied and is under review for such credits.

THE FUTURE

Making the case to address the burden of certification and recertification. Physician certification in imaging adds time, expense, and stress to practitioners. Taking certification and recertification examinations from the ABIM and (potentially 3 additional) imaging boards is burdensome to those in clinical practice and academia. This is most keenly felt by recent trainees, who may take 3 or 4 examinations in a 2-year to 3-year period and have to repeat the process in 10 years for recertification (1). Recognizing and relieving this burden without compromising the established and recognized quality must be addressed by the cardiology community.

Another reality we face is that developing and administering a physician certification examination is expensive and highly dependent on physician volunteers. There are fixed costs with examination development, regardless of whether the examination is taken by 10 or 10,000 examinees. Candidate fees are the only source to pay for these expenses, and some of the existing boards have declining numbers of test takers, resulting in declining revenues. Imaging boards typically have the highest numbers of candidates in the first few years, and there is a decline as the existing practitioners are exhausted and only new trainees apply. Spikes in the number of test takers occur when payers or government agencies demand or encourage certification. Given this financial uncertainty, consolidating operations among several imaging boards has been considered as a measure to stabilize and lower expenses.

The evolution of cardiovascular imaging. The training and practice of cardiovascular imaging have also changed considerably in recent years. In the past, training and clinical practice tended to exist in silos, in which a practitioner would perform and interpret one or two modalities. In today's training programs, there is a growing trend for training in 3 or 4 imaging modalities during general cardiology training, with the goal of emerging as a multi-modality imager (2). Everyone is exposed to echocardiography and generally nuclear cardiology, but increasing numbers are also training in cardiac computed tomography and magnetic resonance during regular cardiology fellowship. Recognizing this changing environment, the ACC developed and published the Core Cardiology Training Symposium for Multimodality Cardiovascular Imaging. These recommendations recognize that there are commonalities and overlap in the physics, instrumentation, and imaging processing for the different imaging modalities, and an integrated comprehensive curriculum is much more efficient and effective.

Under the proposed health care payment models, the question is no longer whether to do stress echocardiography or nuclear cardiology or computed tomographic coronary angiography for the detection of coronary disease, but which test will get the correct diagnosis faster and have the greatest positive impact on the outcome. In such a situation, multimodality trained and certified physicians may serve in a consultative role and will have less bias toward a specific modality and take a more pragmatic approach as to which test is best. Thus, individual testing for competency in each of the modalities (i.e., the current situation) needs to evolve to address selection and integration of all the available modalities in a particular clinical setting. This approach is certainly not being tested by our current imaging boards.

Formation of the Council for Certification in Cardiovascular Imaging. An initial step toward addressing the burden of certification and the change in the practice of cardiovascular imaging was the formation of the Council for Certification in Cardiovascular Imaging (CCCVI). Formed in 2012 as a merger of the CBNC and the CBCCT, the CCCVI's mission is to enhance the quality of patient care through
individual and multimodality cardiovascular imaging certification of physicians. The goal is to have physician certification boards operate in a manner similar to the Intersocietal Accreditation Commission, which serves as an umbrella group for multiple imaging laboratory accreditation bodies, and to gain efficiencies in test development and applicant processing. The CCCVI is a young organization that continues to evolve and grow. The NBE was invited to participate and is taking the invitation under consideration. Similarly, the Society for Cardiovascular Magnetic Resonance has also been involved in discussions, as they are interested in administering an examination in cardiac magnetic resonance, and a stand-alone exam is not financially feasible.

Although the CCCVI is currently focusing on administrative efficiencies for cardiologists who have to take multiple boards, its goal is to facilitate bringing these examinations together as a multimodality imaging examination that will assess not only knowledge and competence in individual imaging modalities but how they integrate. The difficult part will be how to adequately test knowledge and interpretative skills in multiple modalities within a limited time period. This is the challenge that must be met to move forward.

Having representation from all cardiovascular imaging modalities, the Imaging Council serves as a neutral playing field to determine the relative merits of each modality on the basis of evidence and appropriateness. The Imaging Council continues to be supportive of physician certification and moving forward to address future cardiovascular imaging needs to maintain the highest quality possible and accommodate a multimodality cardiovascular imaging world.

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

REFERENCES
