Physician competence is perhaps the most essential part of the many complex components involved in providing optimal healthcare. The patient’s trust that their physicians have the appropriate training, fund of knowledge, clinical decision-making, and technical skills to deliver their healthcare services in a caring manner, with the ultimate goal of providing the safest and most efficacious clinical results, is fundamental to the patient–doctor relationship. Healthcare systems and payers also expect optimal care delivered in an efficient and cost-sensitive manner. The only groups with the knowledge and background required to define and evaluate physician competence on a sustained basis are the physicians themselves.

The United States has historically been a leader in training clinicians and setting quality standards for healthcare delivery. This has been especially evident in the field of interventional cardiology, a relatively young subspecialty with a history of robust evolution and expansion since the early days of Andreas Gruentzig’s pioneering first coronary balloon angioplasty in 1977. During the past 35 years, the field has rapidly and relentlessly expanded. We are a field that started with a rather simple balloon-based revascularization concept only applicable to a limited number of carefully chosen patients. We have now evolved into an expansive subspecialty treating a wide range of both stable and acutely ill patients presenting with a broad spectrum of not only increasingly complex coronary artery disease, but also other cardiovascular conditions. Notably, during the past decade, further expansion into the areas of peripheral vascular and structural heart disease has occurred. This has been accompanied by the proliferation of a voluminous amount of scientific information facilitating our interventional community’s maturation. We have assumed a leadership position in the practice of evidence-based clinical medicine. However, the ever-emerging advances in our field have inevitably led us to another critical challenge in the optimal delivery of patient care, which involves how to best assure physician competence in this rapidly changing scenario. This viewpoint provides a historical perspective on the certification process of the subspecialty training in interventional cardiology. In addition, it highlights the current and future challenges in physician competency that we are currently dealing with as well as measures that may be considered to enable physicians to deliver optimal patient care.

**Certification: Historical Perspective**

The initial interventional cardiology training experience in the United States involved the development of ad hoc unregulated programs mostly located at “high-volume” coronary interventional centers. General cardiology fellows could continue their training for an additional interventional year with the goal of acquiring and further refining their catheterization laboratory-based interventional skills. This was an informal non-Accreditation Council for Graduate Medical Education-sanctioned experience with no universally accepted educational guidelines or targets. Practicing cardiologists desiring to develop interventional coronary skills would often temporarily take leave from their practice and enroll in short-duration (frequently several months) tutorial experiences, which often were facilitated by industry. On returning back to their practice, expert proctors were often engaged to oversee the initial procedural experience at the “trainee’s” home medical institution. Formal, defined, and measurable interventional cardiology certification and training was first introduced in 1999, when the initial American Board of Internal Medicine (ABIM) certification examination was administered in conjunction with the development of structured Accreditation Council for Graduate Medical Education-accredited training programs.

In 1936, 44 candidates were awarded ABIM certificates for internal medicine, a number which has grown to 7000 certificates annually during the past decade. Five years later, in 1941, the ABIM issued the first subspecialty certificates to 51 candidates in cardiology, a number that has grown to currently 700 to 900 certified candidates annually during the past decade. The initial ABIM certification examination for interventional cardiology was introduced in 1999 described as certification for an “Area of Added Qualification” and changed in 2006 to a designation of subspecialty board certification. The vast majority of this group of 2115 candidates who received initial interventional cardiology certification qualified for the examination through the “practice pathway” requiring the candidate to have performed either 500 coronary percutaneous interventions (PCIs) during their lifetime or 150 PCIs during the 2 years before applying to take the certification examination. This procedural volume target was applied for those candidates out of training for at least 3 years. The more traditional “training pathway” mandated a minimum of 250 interventional cardiac procedures.
performed during an accredited 12-month interventional cardiology fellowship training program. The practice pathway track was available only from 1999 to 2003; however, the procedural volume requirements for the training pathway for initial certification remain unchanged today. In addition to meeting procedural volume and passing a secure examination, interventional fellow candidates for certification must also present documentation from their training program director attesting to their clinical competence in such areas as practice-based learning and improvement, interpersonal and communication skills, professionalism, and system-based practice.

The medical community has always appreciated lifelong learning to be an important component of maintaining physician competency and providing excellent patient care. Accordingly, ABIM interventional cardiology certification is time-limited, valid for a 10-year period requiring subsequent cyclic recertification. Maintenance of certification candidates are required to participate in several learning programs or modules, pass a secure recertification examination, and meet a procedural volume target of a minimum of 150 PCIs during the 2 years before expiration of their certificate. Early data from the initial training pathway certification groups of 1999 to 2000 show >80% of this group maintained their certification as of 2012 suggesting robust participation in the recertification process.

The Changing Landscape: Current Challenges

The Rapid Evolution of Interventional Cardiovascular Practice

Similar to the challenges outlined in a previous focused editorial in this journal dealing with the regulatory agencies oversight of product efficacy and safety, assuring that physician competency keeps pace in a rapidly changing interventional cardiovascular environment is an important assignment to provide optimal healthcare services. The constantly evolving nature of our relatively young subspecialty presents a landscape with many challenges. The robust and sustained evolution of the pharmacological and medical device industry in our field has dramatically changed our practice during the last 2 decades at a pace and complexity unmatched in most other medical fields. New devices (eg, transcatheter valves) emerge, whereas older devices (eg, rotablator) either sunset or are used with less frequency while still remaining valuable assets in the interventional cardiologist’s toolbox. As earlier generation interventional cardiologists retire, how do we assure that patients in the future will have access to these technologies placed in the hands of physicians adequately skilled in their application? How do we as a physician community address competency as new devices continue to emerge appreciating this process involves training and sufficient exposure to these devices to maintain procedural skills? These challenges become increasing complex as many but not all interventional cardiologists expand their practice to include peripheral vascular and structural heart interventions requiring expanded cognitive and procedural skill sets.

Evolving Educational Concepts

Cognitive Competence

The origin of competency-based medical education goes back 60 years. However, this concept has been increasingly brought to the forefront during the past decade. Although traditional education focuses on the acquisition of knowledge and teaching processes, competency-based medical education is more focused on outcomes, emphasizing abilities, and placing less emphasis on time-based learning and the processes of teaching. Skills and outcomes are not secondary to knowledge. For example, having a vast amount of medical knowledge is not satisfactory compensation for poor communication skills or poor judgment. The goal is to prepare or maintain physician competence for practice to best fulfill patient and societal needs in a transparent and measurable manner. Although competency-based medical education defines competencies, this concept also promotes greater “learner centeredness,” placing the responsibility on the physician to adjust and manage their own lifelong learning to achieve and maintain competency milestones. The Accreditation Council for Graduate Medical Education has agreed to this concept in the area of fellowship training and this has been embraced by the ABIM in executing their charge to certify competence.

Interventional cardiology requires multiple skills including cognitive and procedural competencies. Maintenance of certification examinations have been met with mixed emotions, often criticized for being tedious, irrelevant, costly, and inconvenient creating a system requiring candidates to constantly take examinations depending on how many specialties and subspecialties they wish to retain their board certification. The association between the maintenance of certification (examination scores) and quality of care has been of interest as data has emerged suggesting a positive relationship. Although no data exist regarding interventional cardiologists, internists demonstrating higher cognitive skills by performing better on the internal medicine maintenance of certification examinations were found to provide better quality of care as evaluated by outcome measures derived from an analysis of a large Medicare database.

Procedural Competence: The Volume Question

The evaluation and maintenance of procedural competence presents an even more challenging issue. Historically, procedural volume has been used as a surrogate for catheterization laboratory procedural performance as one of the benchmarks involved with certifying competence. Similar to using time-based learning as a surrogate for competence, procedural volume is measurable and intuitively it appears reasonable that the more one performs a procedure, the better skills the operator would attain and retain resulting in better clinical outcomes. The original volume benchmarks were set by experienced interventional cardiovascular experts based on judgment rather than data, which at the time were not available. This relationship of volume to outcome in the field of medicine has been the subject of much investigation and discussion. Overall, high hospital and high physician volumes are associated with better outcomes across a broad range of medical procedures. However, the magnitude of
viding no clear guiding signal. However, these studies correlations involving harder clinical end points such as or a greater need for surgical revascularization. Softer operators have less favorable outcomes, such as more bleed-
cing or a greater need for surgical revascularization. Softer correlations involving harder clinical end points such as in-hospital mortality have been inconsistently reported providing no clear guiding signal. However, these studies have many problems that are frequently encountered when analyzing large retrospective, administrative registries. Incomplete data capture, auditing and reporting, and the inability to appropriately risk-adjust to better understand the implications of these data remain significant limitations of these analyses. Other confounders such as institutional volume and the operator's lifetime procedural experience may also influence the annual individual operator volume correlation to competency and outcomes.

Accepting that a low procedural volume correlation with adverse clinical outcomes might indeed exist, we are provided with no clear signal defining what this lower quantitative volume threshold might be. Intuitively it is difficult to justify not using a minimal procedural volume benchmark as an accepted part of a competency standard. It is not possible to have adequate quality assessment of outcomes without a reasonable number of cases to assess. These challenges present in an environment of a reported overall decrease in PCI procedures and accordingly lower individual operator volumes noted for the past 6 to 7 years. The Agency for Healthcare Research and Quality reports a 20% decrease in coronary stenting in the Medicare population in 2010 compared with peak volumes noted during the 2004 to 2006 time period. The Centers for Disease Control and Prevention data reflect similar overall decreasing inpatient PCI volumes. How do we balance the societal demand for physician competence with the need for facilitated patient access to such life-saving procedures as primary PCI in low population areas? We are also lacking important information regarding the correlation of very high-volume operators and clinical outcomes. Current clinical and economic concerns including the appropriateness of procedures and compliance with suggested clinical practice guidelines are becoming increasingly appreciated as an important component of competent medical care.

The use of simulation has been proposed as a potential tool to assess procedural competence. Currently several simulation companies have products on the market designed to present coronary, peripheral, carotid, and structural cardiac cases that can be used for teaching or evaluation of cognitive and procedural skills. The use of these simulators has mostly been in the area of fellow education, maintenance of certification modules, or industry has used them as a tool to train practitioners to use new or less frequently used devices. There are limited data suggesting simulation might offer a method to assess cognitive and procedural competence by identifying physicians who may be very poor performers. The performance and potential use of simulation is currently being re-evaluated by our professional societies and the ABIM.

A Glimpse Into the Future
We now practice in an environment of increased scrutiny by patients, payers, regulatory agencies, and media. Benchmarks, scorecards, and easily accessible, publically displayed performance reports more and more dominate this new landscape bringing quality issues such as physician performance and competence to center stage. Our performance will be judged by clinical practice outcomes and the appropriateness of our care, and we are now expected to render cost-sensitive care because all these metrics will eventually be tied to reimbursement.

There are several strategies that would facilitate moving forward in our efforts to assure that interventional cardiologists continue to meet the high standards of practice required by our patients.

1. The medical educational community should continue to aggressively push forward applying competency-based medical education concepts in the area of physician education and training to cognitive and procedural competencies. Application of these training to competency concepts offers real opportunities to favorably address many of the perceived weakness of interventional cardiovascular education such as the current minimal 7-year requirement to fulfill all Accreditation Council for Graduate Medical Education training obligations. Less dependency on a time-based learning concept will facilitate the incorporation of additional skills such as peripheral vascular and structural heart disease training into the medical curriculum. This would offer the potential to ease the burden of time required for training without sacrificing competencies. The same concepts could be applied to practicing physicians wanting to either develop or maintain skills in either emerging or less frequently used technologies facilitating the development of more formal lifelong learning and evaluative process.

2. Certification must reflect evolving educational and competency mandates. Certification examinations have already moved away from predominantly testing knowledge to a strategy aimed at evaluating a candidate’s skills in synthesizing data and practicing evidence-based medicine using good clinical judgment. Requiring competency certification and maintenance of certification is vitally important, however, to be most effective and have complete “buy-in” by the medical community, this process must be organized with sensitivity to the financial and time constraints placed on practicing physicians.

3. Evaluating competency must imply recording of performance in a uniform and transparent manner. It is reasonable to set the goal that all interventional procedures and outcomes be entered into registries. These databases should be clinical rather than administrative, enabling risk adjustment to facilitate competency and outcome assessments. This would involve using standardized benchmarks and reporting metrics. The reassessment of current procedural volume targets is currently underway attempting to better understand the relationship between procedural competence and outcomes with procedural volume in our current practice environment.
Sensitivities to patient access and societal needs must be considered.

4. Physician competence is just one of the components of quality assurance. Coordinating physician performance initiatives with other complementary hospital quality initiatives including organizing local monitoring and corrective programs is essential.

Our professional societies have proactively accepted their responsibility to provide direction and leadership involving many of the issues discussed here. The practicing interventional cardiologist cannot be passive and must actively define and participate in competency and quality initiatives or these responsibilities will be assumed by less qualified regulatory groups. Fortunately, we are a robust subspecialty with a tradition of overcoming these types of challenges, promising a bright future for our field and for our patients.

Disclosures
Dr Bass is Chair of the American Board of Internal Medicine question writing committee for the certification examination in interventional cardiology. He is also President-Elect of the Society for Cardiac Angiography and Interventions and serves as Vice-Chair on the American College of Cardiology Foundation/American Heart Association/Society for Cardiovascular Angiography and Interventions 2012 Update of the Clinical Competence Statement on Cardiac Interventional Procedures. This article reflects the opinions of the author and not necessarily those of these organizations.

References

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