Competency-based Education in Anesthesiology

History and Challenges

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ABSTRACT

The Accreditation Council for Graduate Medical Education is transitioning to a competency-based system with milestones to measure progress and define success of residents. The confines of the time-based residency will be relaxed. Curriculum must be redesigned and assessments will need to be precise and in-depth. Core anesthesiology faculty will be identified and will be the "trained observers" of the residents' progress. There will be logistic challenges requiring creative management by program directors. There may be residents who achieve "expert" status earlier than the required 36 months of clinical anesthesia education, whereas others may struggle to achieve acceptable status and will require additional education time. Faculty must accept both extremes without judgment. Innovative new educational opportunities will need to be created for fast learners. Finally, it will be important that residents embrace this change. This will require programs to clearly define the specific aims and measurement endpoints for advancement and success. **(ANESTHESIOLOGY 2014; 120:24-31)**

THE Accreditation Council for Graduate Medical Education (ACGME) is transitioning from a time-based to a competency-based education system. It is a learner-centered approach that emphasizes achieving specific outcomes called milestones. The ACGME milestone project was designed to allow each Graduate Medical Education program to identify the behaviors and attributes that constitute the essential competencies for their specialty.[1] A key assumption for our specialty is that the skill set and knowledge required to provide safe and effective anesthesia care can be broken down into subsets called milestones. The milestones are subsets of the six general competencies, and each must be easily identifiable and measureable. Education leaders in anesthesiology have identified 25 milestones and have framed each milestone in the context of a developmental continuum from novice to expert. It is expected that progression through the milestones will lead to overall proficiency in the specialty.*

The rate of achieving competency now becomes individualized for each resident. The traditional assumption that all residents will progress similarly at developing proficiency in the specialty no longer exists. This concept will create special challenges for education programs where the acquisition of the competencies may no longer be defined simply by a fixed time in the program. Rather, length of education should be removed from the equation in favor of a visible demonstration of knowledge, skills, and behavior attainment. Some will argue that becoming a competent anesthesiologist is more than the sum of the individual milestones. Reducing complex behaviors required of an anesthesiologist into small observable units of behavior is a reductionist approach when a more holistic approach to resident assessment may be sufficient.[2] Qualities that distinguish outstanding providers, for example, critical decision making, multitasking, situational awareness, empathy, leadership, and resource management, may not be adequately developed and assessed in the milestone model.

Since this conversation first began, there has been debate over the "what, why, and how" of a competency-based, postgraduate education program for anesthesiology that incorporates milestones into the learning process.[3–6] As Yogi Berra once said, "If you don't know where you're going, you ain't gonna get there." Educators will debate the costs and benefits of a changed construct for education, and program directors will lament the challenges with curriculum design and equitable and consistent assessment. Residents will need to know precisely how they are progressing and what it takes to achieve the expert level of each milestone. This monograph reviews the historical basis for the time-based and competency-based education programs and presents some of the special challenges resulting from the upcoming paradigm shift to milestones in anesthesiology training programs.

Historical Perspectives on Medical Education

Before the initiation of a time-based residency program, young, aspiring, physician trainees learned their specialty as apprentices. As might be expected, there was substantial variability with patient contact and case exposure that led to a highly inconsistent development of diagnostic and surgical

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* ACGME. Available at: http://www.acgme-nas.org/milestones. Accessed September 11, 2013.

skills. During this early developmental period in medical education, the goal of the schools was frequently financial gain rather than high-quality physician education.

In 1889, the fundamental elements of a time-based education program were described at Johns Hopkins. William Welch, M.D. (1850–1934, Professor of Pathology, Founder Johns Hopkins Hospital), a Yale graduate who served as the founding Dean at Hopkins, recruited William Osler, M.D., 1849–1919 (Professor of Medicine, Founder Johns Hopkins Hospital), as the first Chief of Medicine. They and colleagues established a science-based foundation for medical education. The first residency was established with a predefined program length and structured educational content.[7] Medical education transformed to direct patient experience with escalating patient care responsibilities. A period of supervised practice was to follow completion of medical school.[8] Over the next century, the Hopkins model was conceptually challenged, but stood the test of time reasonably well. Refinement in the time-based model for residency education occurred along the way with four periods of distinct change. These occurred with the Flexner Report of 1910, with the passage of the Medicare Bill of 1965 and the nearly simultaneous publication of the Millis report in 1966, with the formation of the ACGME in 1981, and most recently with the ACGME's adoption of the six general competencies for graduate medical education in 2002.

One of the first improvements to the time-based model established at Johns Hopkins followed a comprehensive report by Abraham Flexner[9] (1866–1959, American Educator, Founder of the Institute for Advanced Study in Princeton) to the Carnegie Foundation, entitled *Medical Education in the United States and Canada* (aka the Flexner Report) in 1910. Flexner was a brilliant educator and a non-physician who had few prejudices and preconceptions regarding medical education. After 19 yr of teaching, he became a research scholar at the Carnegie Foundation for the Advancement of Teaching. He visited 155 medical schools in the United States and Canada to complete his comprehensive survey. His report and recommendations were influenced by his previous knowledge of university-based, German, medical education programs and their emphasis on the scientific basis of medical practice.[10] The Flexner Report sounded the death knell for the for-profit proprietary medical schools in America, helped establish the requirement of a college degree for admission into medical school, and formed the basis of the 4-yr medical education (2 yr in the "laboratory" and 2 yr in the hospital).[7]

In the early to mid-1900s, internship was most often the completion point of medical education with only a few choosing to proceed to a specialized residency. Residency programs were more about service than education. There was no central authority that governed approval of residency programs, other than the specific Residency Review Committee (RRC) for the specialty, leading to fragmentation. In 1963, the American Medical Association, then in its seventh decade, commissioned John S. Millis, Ph.D. (President of Case Western Reserve University in Cleveland, Ohio, 1903–1988) to do a second external review on medical education. The Millis report, entitled "The Graduate Education of Physicians: A Report of the Citizens Commission on Graduate Medical Education," was published in 1966.[11] Although Flexner had emphasized the need for a strong scientific basis to medical education, the Millis report recognized that the explosion of scientific research findings had led to "complexity and fragmentation" in medical education. Furthermore, new scientific findings were not being incorporated into the practice of licensed providers, that is, life-long learning was limited, leading to inadequacies in the quality of medical care provided by seasoned practitioners. The Millis report pointed out that internships were fragmented by rotations in many different subspecialties, too often emphasizing menial tasks of little educational value. Although the Millis report urged that new scientific advances and knowledge be part of intern and resident education, incorporating them into training should not extend program length. Rather, these advances in knowledge needed to be integrated across the entire continuum of medical education, from medical school through residency.

The RRC for anesthesiology incorporated recommendations from the Millis report aimed at reducing fragmentation in education. Specifically, internship became well delineated with rotation requirements in fairly narrow and applicable areas. For anesthesiology residency programs, incoming CA-1s now begin with a more consistent skill set, allowing residency education to focus on building from an established base.

The Millis report also showed great foresight in discussing the corporate responsibility of the hospital system to support education over service, and mentions the need for "translational" teaching and research across specialties. The report recommended a newly formed "commission on graduate medical education specifically for planning, coordinating, periodically reviewing standards of graduate medical education, and for reviewing and approving the training institutions."

Nearly simultaneous with publication of the Millis report, the Medicare Bill of 1965 established the federally managed Medicare program, with funding from a new tax imposed on wages, Medicare provided health insurance for people aged 65 and older, and support to teaching hospitals for graduate medical education, based on the elderly patient census at each hospital and the number of postgraduate trainees needed to assist in the care of these patients. Each training hospital was allocated payments based on the defined length of residency education for each subspecialty. The support was thus integrated into the established model of a fixed-time in a single residency.

In 1981, 15 yr after the recommendations from the Millis report, graduate medical education took a large organizational

step forward with the establishment of the ACGME. The ACGME provided oversight of residency programs and the accreditation process for postgraduate medical education programs. The accreditation process assured the public that safeguards were in place that protected them from receiving unsupervised care from resident physicians.[12] There began an era of increasing public awareness of medical errors emanating from media scrutiny of healthcare delivery, case reports, and commentary in scientific publications. In response to demands for accountability for graduate medical education, on July 1, 2002, the ACGME challenged residency programs to develop a broader, more diverse physician for the workforce. They proposed that the standard assessment of resident performance—patient care skills and medical knowledge—be extended. They implemented requirements for trainees to meet criteria in six areas termed the core or general competencies. Competencies of systems-based practice, professionalism, communication and interpersonal skills, and practice-based learning and improvement were added to medical knowledge and patient care skills. The goal was to develop residents who communicated better, exhibited improved professional behavior, possessed skills adaptable to diverse and ever-changing healthcare systems, and embraced life-long learning.

The early elements of a competency-based educational system for graduate medical education were established by the ACGME within a time-limited training program. Programs were charged with a new focus on learner outcomes. Residents needed to demonstrate knowledge and skills in action (outcomes), rather than simply the acquisition of knowledge and skills. In addition, the ACGME instituted many "lifestyle" rules designed to improve the educational environment for residents. For example, the 2005 implementation of duty hour rules for residents and fellows led to substantial changes in fixed-length residency programs. The ever-growing educational and service needs were, for the first time, reigned in by predefined daily and monthly work hours. As outlined in Nasca's (M.D., M.A.C.P., Chief Executive Officer, ACGME) 2009 Letter to the Graduate Medical Education Community,† it seemed the implementation of duty hour restrictions had unintended consequences for both residency education and patient care. First and foremost, there was shown to be little correlation between restricted duty hours and patient outcomes. At the same time, it seemed that an institution's need to mitigate risk took precedence over affording trainees opportunities for critical decision making. And because faculty had to remain productive and generate revenue, the restricted duty hours led to a concern that programs would not be able to train truly competent physician consultants. Although duty hour restrictions had a positive impact on residents' perception of work/life balance, the additional time was not used to "sleep and mitigate fatigue"—the desired goal of duty hour restrictions. Nonetheless, with continued and growing public concern for the impact of resident fatigue on patient safety, a second iteration of the ACGME duty hour guidelines was established in 2011, forcing additional restructuring of patient care services and education.

† Nasca TJ: An Open Letter to the GME Community. Available at: www.acgme.org/acgmeweb/Portals/0/PDFs/nascalettercommunity10_28_09.pdf. Accessed September 11, 2013.

Milestones within Competency-based Education

The terms competence and competency are not interchangeable. Traditionally, competence refers to a person's ability or the skills and knowledge they possess (learned and/or innate), whereas competency (at a job) indicates a mastery of a subset of knowledge and skills required to successfully perform the job. Competency-based education, then, attempts to define the requirements to become a competent physician by breaking down the sum (a competent, independent physician) into smaller, easy to measure and evaluate, parts (milestones). These milestones are designed to measure an individual's competency in the areas of acquired knowledge and clinical and behavioral skills.

In its fundamental form, competency-based education is an outgrowth of the three learning domains described by Bloom (Benjamin S. Bloom, Ph.D., 1913–1999, American Educational Psychologist) in 1956.[13] These are the cognitive domain encompassing intellectual capability; the affective domain comprising attitude, feelings, emotions, and behavior; and the psychomotor domain reflecting manual skills. As with Bloom's taxonomy, competency-based education looks beyond acquisition of knowledge to the application and synthesis of knowledge. Miller's (George Armitage Miller, Ph.D., 1920–2012, Professor of Psychology, Princeton, NJ) pyramid, developed in 1990, describes a framework for evaluating the progression of clinical development and/or competence in medical education.[14] Here, the model of competence begins with "knows," which will typically apply to the medical student/intern level of development. It follows with "knows how," much like a first-year clinical anesthesia resident, then "shows how" and "does" to achieve professional authenticity at or beyond completion of residency.

Competency-based residency education differs from the traditional time-in-training model because it is defined by outcomes rather than number of encounters. Competency-based education relies on the notion that with specific, measurable outcomes, the subjective nature of assessment prevalent in traditional education programs is replaced with discreet, transparent, achievable objectives for residents to meet. There is a renewed emphasis on the central theme of progressing through residency with the attainment of ever-increasing levels of knowledge and skill. The model of progressive development of the anesthesia resident from entry level to advanced levels is an outgrowth of the Dreyfus (Stuart E. Dreyfus, Ph.D., Professor of Applied Mathematics, University of California-Berkeley) model of skill acquisition.[15] The Dreyfus model described a progression of skill development from novice, that is, the person who essentially

is following rules without context and no sense of responsibility, to advanced beginner, competent, proficient, and finally expert. Competence comes with the learner's ability to organize principles, access the rules relevant to the task, and develop decisions about the task. Proficiency is established with the ability to prioritize and use intuition to guide decisions. Figure 1 is a new model of professional development in a competency-based system. Here progression is displayed with learner development across a continuum of time. Progression through residency education is not tightly defined by finite steps or time, but with progression that is expected to overlap training years and extend into practice.

Outcome-based education was defined by Spady (William [Bill] G. Spady, Director, International Center on Outcome-Based Restructuring, Eagle, CO) as a "way of designing, developing, delivering, and documenting instruction in terms of its intended goals and outcomes."[16] This means the educator must develop the curriculum for the outcomes they want residents to demonstrate, rather than writing competency-based objectives for an existing curriculum. This is, of course, a big challenge to training programs that have historically designed their curriculum around a time-in-training format. Switching to a curriculum that supports an outcomes-based model requires flexibility in curriculum development and assessment methods to adequately meet the needs of individualized learning paths. The robustness of individual assessment tools, the quantity and quality of data being collected, and the frequency of evaluations all have the potential to lead to inherently stronger global assessments.[17]

Fig. 1. A pictorial representation of professional development in anesthesiology training. This figure extends the classic Miller's Pyramid of Assessment of Medical Trainees. Years of training to achieve expert competency are not finite and can extend into professional practice. Speed of development of individual residents is depicted as a continuum. The milestones now serve as the assessment metric to determine the development of the resident during the continuum.

As with every challenging new initiative, there is always the possibility of unintended consequences; that in the quest to meet one need of the trainee, another need goes unmet. That is why, as we transition to competency-based education, it is important to be cognizant of the possible limitations of the outcomes-based model. Challenges with outcomes-based education models lie in both the difficulty of creating curriculum that matches *and* enhances outcomes and the struggle to accurately measure higher-order outcomes within those broader domains.[18] McKernan (Ph.D., Professor of Education, East Carolina University, Greenville, NC) argued that the segmentation and linear assumption of learning assumed in outcomes-based education did not realistically reflect the natural learning process.[19] He also stated that the focus on measurable objectives was often flawed by evaluating what students have not learned.

WHY Change?

The "why" may be as simple as society demands accountability for medical education. Societal and governmental demand, encouraged by our 24-h news cycle, is mostly driven by their growing interest in quality and safety, and avoidance of adverse outcomes (both financial and personal). Although there is no clear evidence in medicine that quality and patient safety will improve with a milestone-based education program, it seems intuitive that it might. From the viewpoint of the learner, the "why change" becomes an argument that begs for improved and expanded experiential learning. The current, time-based model of education, coincident with duty-hour restrictions, has reduced learners' time in the classroom and the hospital, yet scientific advancements have expanded the breadth of knowledge and skills required of a competent physician.

Without too much effort, we can list a number of advances in the field of anesthesiology that arguably require more time for skill development and mastery. Consider the time needed to develop skills in transesophageal echocardiography, ultrasound imaging for nerve blocks and catheter placement, and complex procedures in the pain clinic including radio-frequency ablations, stimulator implants, and ultrasound-guided, neurolytic blocks. In the intensive care unit, anesthesia is being called on with increasing frequency to manage complex patients including a growing volume of patients with multiorgan transplant, demanding knowledge of newer ventilation modes, left ventricular assist devices, and more. Removing time from the equation opens the door to expanded experiential learning in the operating rooms, clinics, intensive care units, and simulation laboratory. Residents become better equipped to provide complex, perioperative care. Some will assume that this means more time will be needed to establish a highly competent resident. The more accurate interpretation would be that education programs will need a robustly defined and developed way to advance the successful resident along the learning continuum; from novice to advanced learner, or from routine cases

to the more challenging, without necessarily adding time to the training program.

For example, to establish competence in cardiac anesthesia could mean standardized classroom teaching, followed by defined experiences in the clinical setting. The resident's progression of skills and knowledge of transesophageal echocardiography, aortic balloon pumps, left ventricular assist devices, on-and-off pump procedures, management of hemodynamics in patients with complex valve abnormalities, right heart failure, pulmonary hypertension, and significant arrhythmias would be carefully structured. If the opportunity did not present itself in the clinical setting, high-fidelity simulation could fill the gap. This type of competency-based teaching and learning could assure that a resident from any program would have a consistent, comparable, and meaningful experience in the specialized field of cardiac anesthesia. The same would need to be developed for all learning areas within anesthesiology.

Although, one can debate whether competency-based education is effective for developing the complex, higher-order skills required to practice as a professional,[20] it has support from a wealth of educational literature documenting its effectiveness. In a study involving 301 residents from four different medical schools, competency-based assessments in defined, simulated experiences were evaluated against supervisors' assessments of residents' "live" performances in clinical settings. Competency-based evaluations consisted of the resident's performance with 50 simulated patient-management problems. Supervisors' evaluations were derived from their direct observations of residents' performance with "live" patient care. On the basis of simply observing the clinical performance, roughly two thirds of residents were considered "competent" at the end of their education program. However, less than 2% of residents were considered competent based on assessment in simulation.[21] Since 1994, Johns Hopkins' Neurosurgery Department has been using a competency-based model in evaluation of surgical skills. They found that residents were able to master skills in the most complex procedures, including pterional craniotomy and exposure of the optic chiasm, at 18 months into their educational program as opposed to 33–36 months in the time-based model.[8]

Competency-based educational models have already been implemented outside the United States. For example, The European Education and Training Group of the European Board and Section of Anaesthesiology has implemented competency-based curricula in anesthesiology, pain, and intensive care. In 2011, they released a new edition of postgraduate education guidelines that define their own outcome-based educational model.[22] These guidelines provided a basic structure that could be individualized to each program. Other outcome-based frameworks for medical education have concluded that the educational domains (outcomes) were not dependent upon a specific teaching methodology and delivery system to be successful. Instead, a medical school that used one teaching approach was equally effective as another using a completely different one.[23] In addition, noteworthy challenges and barriers came from faculty acceptance, and development of adequate resources to implement change.[24]

HOW: Implementation Challenges

Rather than guide us in the educational construct of our resident education programs, the RRC for anesthesiology has defined standard requirements for these programs. These standards defined the educational curriculum and the finite number of experiences the RRC considered necessary for each resident to acquire the knowledge and skills to meet American Board of Anesthesiology requirements for certification. Because residency program structure and operating room staffing models have limited flexibility, education programs designed curriculum and exam thresholds to consider a resident "competent" at the end of the 3-yr time frame. A flaw in the current structure of anesthesiology resident education can occur; for example, if a resident acquires sufficient knowledge to pass the In-Training Exam, meets his/her numbers in cardiac anesthesia, but has never had to deal with a complex cardiopulmonary bypass separation, pulmonary hypertension, right heart failure, and/or an intraaortic balloon pump. Residents can be asked to extend education time if their skills and knowledge are not up to the standards set by the program, but are never asked to extend education time because of failure to have had a challenging cardiac case.

Competency-based medical education provides new challenges to teaching faculty to become "trained observers." Evaluation of learner success within the framework of milestones is far more challenging when compared with traditional assessment methods. Those methods had relied on performance on multiple choice exams, a learner's case experiences, and faculty interactions with the learner, all extrapolated into a summary evaluation.[25]

Two important steps to implementation of the milestones have been left poorly defined: curricular design and validated assessment tools. We will be calling upon our societies to help with these steps. The Society of Education in Anesthesia at their June 2013 annual meeting specifically targeted these challenges with work groups and breakout sessions.

A milestones-based model of residency education will require fluidity in the resident training program, as shown in figure 1. This transition will have challenges including:

1. Unpredictable time spent on a given service and in overall education.

Quite simply, flexibility has to be built into programs. Some residents will fulfill requirements early and hope to head off to practice or enter into advanced educational settings. Others will need additional core training and risk the stigma of extended training when competing for fellowships or jobs. Accelerated learners who rotate off a service or out of training

(currently not defined in the American Board of Anesthesiology guidelines) will increase demand for more physician extenders and may add a financial burden on anesthesiology departments and institutions. Residents not providing direct patient care due to advanced educational opportunities could lose rigidly defined Medicare-Graduate Medical Education funding support and add to the department's cost of resident education. The RRC for anesthesiology has previously defined a minimum time on subspecialty rotations and in residency education. This may prove to be too limiting to the milestones concept. Experiential learning theory would suggest that a resident who meets case number criteria on subspecialty rotations would further develop skills and imprint learning by repeating the same or similar process over and over. Because safe practice builds on repetitions and routines, learners who have already achieved competency in a specific milestone might not benefit from a pathway to finish in a shortened time frame. Rather, they might enter into an advanced or expert education process and be "teachers" to their colleagues.

2. Dangers of fluidity

When competency-based residency education is fully adopted, will education programs be compelled to allow rapid learners to complete their formal education early in order to keep them competitive in the resident recruitment process? Lack of consistency in implementing milestone-based education could lead to unfair competition as medical students burdened with debt might chose a program with the greatest potential for a "fast track" to advanced training and/or junior faculty wages.

Offering a fluid education program could also negatively impact the fellowship application process.[26] Currently, this process begins over a year before completion of residency, with most positions filled well in advance of graduation. Would fellowship programs want to know about the rate at which the candidate was meeting milestones and their anticipated date of graduation? Could they accept fellows "off-sequence" if residency education was truly fluid? This raises a point for changing medical education at all levels, as opposed to just altering graduate medical education programs.[27]

3. Resident acceptance

We must be careful not to disincentivize residents. The milestones provide a developmental road map for achieving the general competencies and should clearly inform residents where they are in attaining the necessary knowledge, skills, and attitudes to progress to the next level. Thus, early achievement of a set of milestones could or should come with rewards. Perhaps the reward is as simple as advancing to the next level on the developmental road map, but there may be ways to add other incentives. For example, rapid success with milestones in cardiac anesthesia should open up other opportunities while on rotation for advanced education or unique cases. This could include advanced experiences that a cardiac fellow might typically get, for example, transesophageal echocardiography or transthoracic echocardiography training with the cardiology department, taking on a quality improvement project in the subspecialty, developing innovative teaching models using electronic media, or perhaps receiving special recognition within the program. Departments could offer financial incentives for accelerated success, such as an earlier opportunity to moonlight, or payment for transesophageal echocardiography certification, a review course, books, or board examination fees.

Perhaps the incentive to succeed is an early transition from resident to resident instructor. The "fast learner" could be assigned to mentor junior residents, or to manage their own cases, or involve themselves in teaching in the classroom or simulation laboratory. Residents would continue to gain experience in an environment of "lightened" faculty supervision that comes with acquired competence. Another option might be to create mini-fellowships for early achievers. This would offer advanced training in a subspecialty, in education, or patient safety and quality improvement, while not compromising residency complement numbers or American Board of Anesthesiology/RRC training requirements. Any of these options would provide a strong incentive for residents to achieve milestones in a timely manner.

Caution is warranted however. Residents will need to know precisely how they are advancing in the milestone-based education program. This means programs must have clear goals and objectives so that we can better measure achievement. In a recent study from Denmark, the intern perspectives on the gains and losses when transitioning to a competency-based, 12-month curriculum from an 18-month, traditional, process-based program were determined. These interns felt the learning outcomes were very context specific. They expressed concern about lack of flexibility in rotations. They had welcomed the transition hoping for better supervision and feedback but did not sense an improvement.[28]

4. Faculty acceptance

Successful outcome-based education requires significant faculty "buy-in" and acceptance that the milestones are not isolated and superficial add-ons to training requirements. As the faculty are both the deliverers of content and the assessors of competency, it is essential that they support the notion that the adoption of competency-based education is beneficial to them, their trainees, their institution, and the field of anesthesiology. When Brown University School of Medicine switched to competency-based education, they found their faculty were initially skeptical, with the attitude of "if it ain't broke don't fix it." Furthermore, faculty worried that a curriculum that valued competency and skills would leave room for huge deficits in knowledge base.[29] Faculty may feel that the complex tasks required for an anesthesiologist cannot be broken down into simple behaviors (necessary for assessment) and that the milestones might have limited applicability to clinical practice. The foundation of faculty buy-in may be the tangible demonstration that what they will do

going forward is better than what they have been doing. Thus, faculty buy-in will require measurable and deliverable outcomes, both in the form of tangible test scores, better patient outcomes, and an overall betterment of the daily clinical life, reflecting the new core values of the department and/or institution. The change to a competency-based educational process may afford faculty opportunities for novel ways to participate in academics. Finally, faculty must be made aware that the decision about whether a resident is ready for independent practice has not changed; rather, the milestones have provided a framework and tools to help the program director to make that decision.

Assessment Challenges with Competency-based Training

There are a number of opportunities for meaningful assessment when using a competency-based education model; the greatest being that evaluations are based on a detailed rubric (the milestones) that is available to both the trainer and trainee. Outcome-based education is advantageous to learners because it promotes individual achievements by the learner, rather than focusing on the amount of time it took to achieve one or more milestones.[30]

Competency-based education is particularly suited to the assessment of discrete procedural skills, for example, intubation or line placement, because of its focus on individual and attainable patient care skills, but remains lacking in the assessment of the nontechnical skills such as judgment and/or decision making. Because the focus is on whether or not the resident can perform a specific skill and not whether or not they use it correctly and appropriately, it can be difficult to measure their true global performance. Another way to consider this is the jigsaw puzzle analogy. When one is in possession of all the individual puzzle pieces (milestones), there remains a significant effort required to correctly place all the pieces together to complete the puzzle—it is only then that one can view the picture (the resident). Our assessment tools must not only measure the individual pieces but must aggregate them into a recognizable, complete, "high def" picture that defines the true, multifaceted competency of that resident. Furthermore, the assessment must not focus on the minimum level of acceptable performance (performing at an expected level), which could potentially discourage residents from striving to exceed the standard.

There are other unwanted consequences of breaking down the key elements in resident education to a series of checklists. Hodges *et al.*[31] suggested that checklists (Objective Structured Clinical Examinations) are poor discriminators of expertise, and in fact, in the absence of some sort of global rating metric, experienced physicians may score even lower on checklists than trainees. Having a global performance metric such as, "Do I trust this trainee to perform this task independently?" could be a more reliable way to discriminate between high and low trainee performance.[32] Assessing the competence (*i.e.*, trustworthiness) of a resident for independent clinical work is a construct based on that resident's knowledge, skill, discernment (*i.e.*, insight into and awareness of limits), conscientiousness, and truthfulness.[33]

Outcome-based curriculum relies on trained observers (faculty) and performance-based assessment measures of individual, specific skills that are actually demonstrated in person. The challenge is in finding the appropriate assessment tools to measure the specific outcome. For example, communication skills can be assessed "on-the-job" or *via* the completion of a scholarly presentation, and can be a focus of many types of multisource assessments by different types of providers, including nurses, technicians, and other specialists. However, other skills, such as life-long learning, require a longer-term relationship between the evaluator and the trainee to adequately judge whether or not the skill has been internalized.[34]

Making the Transition

The changes that need to be made in order to go from a time-based residency to a competency-based residency will be a noteworthy challenge. Iobst (William F. Iobst, M.D., Physician, Allentown, PA) has postulated that, "The transition will likely include intermediate hybrid frameworks containing time and process components as well as specific competency-based outcomes."[27] There must be flexibility and adaptability built into education programs to account for resident variations in skill achievement. Robust tools for assessment will need to be developed.

We have summarized other challenges with funding, incentivizing, and avoiding stigma. We have also offered ideas for a framework to meet the challenges of those most successful residents who meet the milestones early. The transition to the new model, regardless of how it is done, will require a well-organized plan that includes faculty and learner acceptance as well as strong administrative support.[35] There will be a significant investment of time to train faculty to be skilled assessors of residents' knowledge and skills. There will be a daunting challenge to gain faculty acceptance of the new paradigm and this will only be achieved when improved learner outcomes can be demonstrated. We must not forget the residents in the equation. What will be their perspectives on competency-based training *versus* traditional, time-based education? Residents may prefer generalized objectives (meet rotation objectives, case numbers, and In-Training Exam thresholds) to a more individualized, competency-based education.[28] It is certain that they will demand consistency and reliability in new assessment measures for fairness and to garner the potential rewards from meeting milestones early.

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Competing Interests

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