2010; 32: 651–656 MEDICAL TEACHER

# Competency-based medical education in postgraduate medical education

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## Abstract

With the introduction of Tomorrow's Doctors in 1993, medical education began the transition from a time- and process-based system to a competency-based training framework. Implementing competency-based training in postgraduate medical education poses many challenges but ultimately requires a demonstration that the learner is truly competent to progress in training or to the next phase of a professional career. Making this transition requires change at virtually all levels of postgraduate training. Key components of this change include the development of valid and reliable assessment tools such as work-based assessment using direct observation, frequent formative feedback, and learner self-directed assessment; active involvement of the learner in the educational process; and intensive faculty development that addresses curricular design and the assessment of competency.

## Introduction

Postgraduate medical education (PGME), it its current form, has been criticized as being essentially unchanged from its founding by Osler, Halsted, and others at Johns Hopkins a century ago. However, residency education – the period of training that prepares physicians to enter practice – has undergone a quiet revolution since the early 1990s. With the launch of Tomorrow's Doctors in the United Kingdom in 1993 (General Medical Council 1993, 2009), the framework guiding medical education began to shift from a time- and process-based framework to a competency-based model. International acceptance of this paradigm shift is reflected by the subsequent release of the CanMEDS framework (Frank 2005; Frank & Danoff 2007), The Scottish Doctor (Simpson et al. 2002; Scottish Deans' Medical Curriculum Group 2009), the ACGME Outcomes Project (Swing 2007; Accreditation Council for Graduate Medical Education 2009a,b), Good Medical Practice (General Medical Council 2006), the Australian Curriculum Framework for Junior Doctors (Graham et al. 2007), and the 2009 Framework for Undergraduate Medical Education in the Netherlands (Van Herwaarden et al. 2009). Although the move to competency-based training has just begun, interest is growing. Regulatory organizations now require demonstration of attainment of competency as part of their expectations; in some countries, this requirement now guides accreditation processes. A century after the first trainees entered Osler's "seminary of higher medical education," competency-based medical education (CBME) promises to become the defining framework for postgraduate medical education (PGME) in the 21st century. In this paper, we review the rationale and the implications of a competency-based approach to PGME, its advantages and challenges, and the changes needed to realize a more competency-based vision.

### Practice points

- Implementing competency-based medical education (CBME) in postgraduate medical education (PGME) will require change at all levels of training.
- At the core of CBME in PGME is the requirement that learners demonstrate competence in the application of their learning to patient care.
- Work-based assessment and evaluation using direct observation of learners as they provide patient care is a cornerstone of CBME in PGME.
- Frequent formative feedback to engaged learners possessing critical self-assessment skills is essential to the successful implementation of CBME.
- Faculty development focusing on reliable and valid assessment is critical to the successful implementation of CBME.

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ISSN 0142–159X print/ISSN 1466–187X online/10/080651–6 © 2010 Informa Healthcare Ltd.
DOI: 10.3109/0142159X.2010.500709

**Table 1.** A comparison of the elements of structure- and process-based versus competency-based educational programs.

| | Educational program | |
|---|---|---|
| Variable | Structure- and process-based | Competency-based |
| Driving force for curriculum | Content—knowledge acquisition | Outcome—knowledge acquisition |
| Driving force for process | Teacher | Learner |
| Path of learning | Hierarchical (teacher → student) | Non-hierarchical (teacher ↔ student) |
| Responsibility for content | Teacher | Student and teacher |
| Goal of educational encounter | Knowledge acquisition | Knowledge application |
| Typical assessment tool | Single subjective measure | Multiple objective measures (''evaluation portfolio'') |
| Assessment tool | Proxy | Authentic (mimics real tasks of profession) |
| Setting for evaluation | Removed (gestalt) | ''In the trenches'' (direct observation) |
| Evaluation | Norm-referenced | Criterion-referenced |
| Timing of assessment | Emphasis on summative | Emphasis on formative |
| Program completion | Fixed time | Variable time |

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## Why reform residency education?

Arguably, the incredible successes of modern medical science and practice would not have been possible without the successful growth of residency education worldwide. Intensive clinical training in preparation for practice is now considered imperative after medical school. PGME is now an enormous professional enterprise engaging thousands of teachers and learners in continuous activity. Today's physicians are the most highly educated in history. So why should we consider a new approach to PGME? The weaknesses of our current system lie in its pervasive time-based paradigm. Worldwide, there is a tendency to recognize the successful completion of a residency curriculum as time spent on rotations, as opposed to abilities acquired (Carraccio et al. 2002). Here lies the motivation for CBME: to find a more reliable way to ensure that every graduate is prepared for practice.

## What is competency-based PGME?

As elaborated elsewhere in this theme issue (Frank et al. 2010), CBME focuses on educational outcomes. In a competency-based residency paradigm, programs must demonstrate that the newly trained physician is competent for all aspects of practice. This approach does not prescribe how the teacher or program must teach or how the student must learn while achieving that goal. Rather, competency-based training explicitly defines desired graduate abilities and allows those outcomes to guide the development of curricula, assessment, and evaluation. CBME for residency therefore de-emphasizes fixed time periods and promotes the progression of competence from milestone to milestone in all of the essential aspects of practice. CBME also calls for new instructional methods, greater flexibility in organizing the sequence of experiences, more frequent assessment, meaningful supervision by expert faculty, and greater engagement of both teachers and trainees in the pursuit of *abilities* – not just *knowledge* – as the curricular goal. Competency-based residency education is competence by design, not merely opportunistic learning during years of providing clinical service. Carraccio and co-authors (2002) have described the elements of the CBME paradigm shift in the approach to training (see Table 1).

## Realigning curricula in CBME

Traditional graduate medical education is structured around time frames and curricular processes. It is an opportunistic approach defined by ''dwell time,'' whereby a specified number of months is assigned to discrete activities over prescribed periods. To a large extent, assessment focuses overtly on demonstrating whether the learner has acquired specific knowledge; to a much lesser extent, it focuses on the acquisition of skills and attitudes. Program evaluation tends to focus on matters of process (e.g., ''Are there objectives for every rotation?'' or ''Is there a teacher evaluation form?''). The vast majority of learners successfully complete their training by meeting time, process, and curricular requirements. When those requirements are met, the ability to apply what is learned to the actual delivery of patient care is assumed, without actually assessing whether the application of that learning to health care delivery occurs. In contrast, competency-based training is based on the successful demonstration of the application of the specific knowledge, skills, and attitudes that are required for the practice of medicine. Progression in training requires that the learner demonstrate competence at critical stages of development. The curriculum, assessment tools, and evaluation system are developed to achieve and document this outcome. Assessment and evaluation at this level must occur during the actual delivery of care. Miller's pyramid of assessment conceptualizes this process (1990). In this model, assessments are directed at learners' ability to demonstrate that they either ''know, know how, show how, or do.'' Although the type of assessment must be appropriate to the competency being assessed and to the learner's stage of learning, CBME ultimately requires assessment at the very top of this pyramid. This requires that learners demonstrate the ability to provide safe and effective patient care and is best accomplished through direct observation.

CBME requires the demonstration of competence to advance in training or to the next phase of a professional career. Because most learners at the PGME level will ultimately provide direct patient care, their assessment and evaluation should focus on the abilities needed for the actual delivery of that care. Competence thresholds must be clearly defined and understood by both assessor and trainee, and assessment must be accurate in order to reliably determine whether the trainee is competent. In a pure competency-based training framework, effective assessment would allow the learners to advance in a program at different rates on the basis of the successful demonstration of competency. Some learners would advance more quickly; others, to a point, would advance more slowly. This requires that learners have clearly defined targets throughout training to guide learning and inform assessment and evaluation. The developmental milestones for Internal Medicine residency training developed by Green and associates (2009) are one example of how these targets can be defined. These milestones describe discrete behaviours or significant points in development that, when met, allow evaluators and programs to know that a learner is truly ready to progress to the next stage of training.

## Teacher-learner relationship and responsibilities

In a traditional residency design, learning is teacher driven. In competency-based training, it is a collaborative process in which responsibility is shared between teacher and learner. This collaboration requires that the learner be an active participant in determining a learning plan, and that the teacher provide frequent and accurate formative feedback (Westberg & Hilliard 1993). Critical skills required of the learner include self-directed and lifelong learning, self-reflection, and self-assessment. Epstein and colleagues (2008) have described self-assessment as "the process of interpreting data about our own performance and comparing them to an explicit or implicit standard." However, although self-assessment is critical to successful and continuous practice improvement, commitment to excellence, and self-monitoring, many studies have demonstrated that physicians-in-training are inaccurate self-assessors (Hodges et al. 2001; Davis et al. 2006). Self-assessment is best completed using expert role models or exemplars of performance as performance criteria, or, alternatively, multiple information sources, and should not be completed in isolation. The latter requires that the learner take responsibility for seeking feedback from external sources and use that information to guide performance improvements in a process that Eva and Regehr (2008) have called "self-directed assessment seeking." Examples of such external sources of information could include feedback solicited from multiple observers, in-training exam results, outcomes of simulation performance, and/or data gleaned from a practice audit. Feedback from faculty is, however, a critical source of such information and requires direct observation of the learner. The dynamic interaction between teacher and learner in a CBME framework can clearly facilitate this process. To meet this responsibility, programs must create safe learning environments and clearly define roles and expectations for all participants.

CBME also requires that programs ensure adequate learner supervision. As recommended in the Institute of Medicine's report on resident work hours (2008), accrediting organizations, sponsoring institutions, and training programs should establish measurable standards of supervision for each trainee appropriate to his or her level and specialty. Traditionally, senior learners teach and supervise junior learners with increasing responsibility during training. Frequently, this occurs with limited faculty supervision. This activity is seen as critical to the learner's professional development and is believed to be a vital component of the learning community and culture of training programs (American Board of Internal Medicine 2009). However, despite work by Ericsson and colleagues (1993) that has called into question the benefit of coaching by individuals who themselves are not experts in the field, supervision of junior learners by advanced learners often occurs without adequate assessment of whether the more senior learner is actually competent to provide supervision. Moreover, training programs should not be overly dependent on learners to identify and remediate situations where peer learners are in difficulty. Appropriate supervision for all levels of learners can enrich learning while at the same time ensuring the delivery of safe and effective patient care.

## Approaches to assessment

The process of *assessment* comprises the methods, tools, and processes used to generate information about learners' readiness to progress in training or start practice. *Evaluation* refers to the judgment or interpretation of those data as they relate to the utility of a curriculum. As described by Holmboe and colleagues (2010) elsewhere in this issue, CBME requires enhanced assessment tools and processes.

The successful implementation of competency-based training will require that all faculty understand and model competency-based practice. Faculty must also be actively involved in curriculum development. Assessment and evaluation will require that faculty develop specific skills in the direct observation of trainees delivering care. Although simulation will likely play an increasingly important role in competency assessment over time, the direct observation of learners providing care will remain a cornerstone of assessment and evaluation process. As Carraccio and colleagues (2002) have noted, competency-based education and training requires *greater* involvement by faculty because of the need for direct observation and increased frequency and quality of formative assessment.

The basic skills of interviewing, examining, and counselling patients are essential to effective patient care. Evaluating these skills using direct observation is a critical part of every competency-based evaluation system. Unfortunately, most faculty are not prepared to perform direct observation in a reliable and valid fashion. Multiple studies have demonstrated that many practising physicians and faculty members are not competent to perform these skills. Faculty must not only learn the essential components of these skills, but must also learn how to deliver valid and reliable evaluations of learners

performing these skills. Fortunately, the performance appraisal literature suggests that faculty development can reduce rating errors, improve discrimination, and improve the accuracy of evaluation (see Dath & Iobst 2010, in this issue).

Effective faculty development for direct observation must aim to create a shared mental model or level of understanding about direct observation that will ultimately enhance the reliability and validity of assessment at the program level. Such rater training should seek to gain agreement on the essential elements of the competency to be observed, standardize criteria for rating that competency, and develop strategies to increase the frequency of observations (Holmboe 2008).

Some have argued that CBME reduces the practice of medicine to itemized lists of objective observable criteria (Brooks 2009). Others (Grant 1999) observe that the whole of competence is greater than its individual parts and that, ultimately, the demonstration of competence in the delivery of patient care represents what Fleming (1993) has described as meta-competency. The concept of meta-competency recognizes the complex mix of individual knowledge, skills, and attitudes, as well as cultural and social contexts, required for safe and effective practice in actual health care environments. Assessing such meta-competencies requires valid and reliable multi-dimensional assessment, multiple data points, and a robust system for collecting, processing, and acting on evaluation information. Reliable and valid meta-competency evaluation requires that faculty evaluators have deep knowledge and experience in the delivery of patient care. This also requires that all participants understand that the evaluation of meta-competency requires more than simply checking off items on a list. Attesting to meta-competency will require that evaluation addresses the ability to competently perform in a universe of similar situations and that observed performance can be extrapolated to performance in practice situations that are not directly evaluated (Williams et al. 2003).

With the exception of procedural training, the traditional model of medical education has not prioritized direct observation skills in residency evaluation. The foundational evaluation in this framework is typically end-of-rotation evaluation based on a gestalt evaluation developed over the course of the educational experience.

## Criterion-referenced assessment

The valid and reliable assessment of knowledge application is critical in CBME. This requires criterion-referenced rather than norm-referenced standards of assessment. In norm-referenced evaluation, the evaluator uses the performance of immediate and available learners to establish criteria. This approach risks either overrating or underrating performance. In criterion-referenced evaluation, predetermined criteria inform evaluation. The recently released Internal Medicine Milestones are an example of such criteria. These milestones are behaviourally based and offer criteria to ensure that residents acquire the knowledge, skills, and attitudes necessary for advancing in their program and for entering the next phase of their careers. However, while such milestones can inform criteria referenced evaluation, they do not mandate a "one size fits all" assessment system. Programs will need to develop assessment systems that facilitate criterion-referenced evaluation based on their unique clinical environment and resources.

## Timing of assessment

Assessment can provide either formative or summative evaluation. In a competency-based education system, formative assessment that provides feedback is essential to guiding the learner's participation in the educational process. Trainees must become comfortable seeking formative assessment/feedback, and faculty must offer it frequently. Programs will need to cultivate a safe educational environment for this process and to create multiple opportunities for assessment and the delivery of feedback. Frequent formative assessment is currently not a significant component of most program evaluation systems. The typical end-of-rotation gestalt evaluation is not delivered in close temporal proximity to the actual educational experience, and so cannot succeed in providing immediate, direct feedback to the learner.

## Flexible duration of training

A key distinguishing feature of CBME is that learners progress at their own rate in accordance with demonstrated ability. Unfortunately, the prevailing structure of PGME makes the adoption of a pure competency-based training system challenging at many levels. Rightly or wrongly, program directors believe that programs and residents benefit from a maturation process that requires structure and some degree of supervision while allowing for progressive independence (American Board of Internal Medicine 2009). They also believe that this process requires a fixed minimum period of training for *all* learners. Moving to a competency-based model risks disrupting this process by virtue of the early advancement of some residents and the delayed advancement of others. However, accomplished learners should advance as they demonstrate competence. Within limits, CBME should also provide appropriate time in structured learning environments for challenged learners. CBME must also recognize that a learner may be accomplished in certain domains and challenged in others. However, to ensure that program graduates can provide safe and effective patient care, no learner should be prematurely pushed through the system, and every learner should be given appropriate time to develop the desired competency. Finally, the current system of PGME funding is based on a fixed duration of training, and strategies to fund a competency-based, flexible-time model have yet to be proposed. For CBME to advance, a redesign of the entire system will be necessary. This will require change at all levels of the educational process.

## Realigning accreditation with program evaluation

In support of CBME, accreditation requirements have become increasingly focused on outcomes. For instance, ACGME-accredited Internal Medicine programs must now demonstrate evidence of data-driven improvements to the training program by using resident performance data, or outcomes, as a basis for

improvement, and use external measures to verify both the learner's and the program's performance (ACGME 2009b). Similarly, all Royal College of Physicians and Surgeons of Canada programs require demonstration of both traditional time-based rotations and specialty-specific competencies (Accreditation Committee 2006).

## Residency redesign as change

At the level of the individual stakeholder, the transition to a competency-based training model can represent a dramatic redefinition of professional identity. Many faculty completed training before the era of competency-based training. For these professionals, CBME represents uncharted waters, and the paradigm shift described by Carraccio and associates (2002) can give rise to feelings of profound loss as faculty face the potential redefinition of their professional identities as educators.

## Conclusion

We believe that the graduate medical education community must embrace the evolution to CBME. This transition will involve overcoming a number of challenges. Understanding the importance of implementing a competency-based training framework is only the beginning of the process of change. Allowing for the flexibility to meet the needs of the learner while promoting change in the existing infrastructure of a time-and-process based system will be critical. Given the diversity of programs and training sites, no single road map will fit all programs. Although competency-based training is the ultimate goal, the transition will likely include intermediate hybrid frameworks containing time and process components as well as specific competency-based outcomes. The support of senior institutional administration and the leadership provided by the program director and key faculty champions at the local level will be critical to successful implementation. At the national level, accreditation and key stakeholder organizations must continue to lobby for PGME policy reform and the appropriate resources to ensure that CBME becomes a reality.

***Declaration of interest:*** The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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