# Competency-based medical education: implications for undergraduate programs

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## Abstract

Changes in educational thinking and in medical program accreditation provide an opportunity to reconsider approaches to undergraduate medical education. Current developments in competency-based medical education (CBME), in particular, present both possibilities and challenges for undergraduate programs. CBME does not specify particular learning strategies or formats, but rather provides a clear description of intended outcomes. This approach has the potential to yield authentic curricula for medical practice and to provide a seamless linkage between all stages of lifelong learning. At the same time, the implementation of CBME in undergraduate education poses challenges for curriculum design, student assessment practices, teacher preparation, and systemic institutional change, all of which have implications for student learning. Some of the challenges of CBME are similar to those that can arise in the implementation of any integrated program, while others are specific to the adoption of outcome frameworks as an organizing principle for curriculum design. This article reviews a number of issues raised by CBME in the context of undergraduate programs and provides examples of best practices that might help to address these issues.

## Introduction

Issues surrounding the definition, application, and desirability of a competency framework in medical education, including its appropriateness for undergraduate medical education, have been debated in the literature (Grant 1999; Talbot 2004). Typically, competency frameworks have been more readily applied to postgraduate specialty training, where the graduate's performance can be closely defined by the criteria of the relevant specialty. However, changes to undergraduate curricula and evolving national accreditation standards (such as the Tomorrow's Doctor initiative in the United Kingdom and the National Undergraduate Framework in the Netherlands), together with enhanced definitions of competency-based medical education (CBME), as discussed in other articles in this issue, have moved the debate to a new stage.

Various frameworks for learning outcomes that are in use or in preparation apply a competency-based approach to medical student education (e.g., Scottish Doctor, Netherlands National Undergraduate Framework, CanMEDS). An undergraduate medical program prepares the learner for professional life in a discipline that is based in change and thus requires regular curriculum review to ensure currency and relevance. Competency-based frameworks are designed to move beyond routine curricular renewal. This article sets out to review a number of issues raised by CBME in the context of undergraduate programs and to provide examples of best practices that might help to address some of these issues.

The lack of a consistent language surrounding competency frameworks, along with an underlying lack of conceptual

### Practice points

- A competency framework based in the requirements of clinical practice provides a seamless linkage from the undergraduate phase to the phase of supervised practitioner.
- Competency-based programs in undergraduate education will require a greater focus on formative assessment so that they provide increased opportunities for students to make decisions about their own learning.
- Structured learning activities for students should lead to explicit, assessed competency outcomes.
- As clinical teachers are often engaged across the spectrum of undergraduate and postgraduate medical education, adopting a competency focus in postgraduate training will facilitate the introduction of suitable tools for learning and assessment in undergraduate education.

clarity, has been a substantial obstacle to the advancement of CBME. One point of contention in the discussion of any outcome- or competency-based undergraduate curriculum model is the notion of separate and independent competencies, given that competencies or capabilities reside in integrated professional performance.

Using a competency-based framework to describe the activities and performance of the practising professional and working backward to build enabling competencies in the undergraduate curriculum may provide an authentic curriculum focused on the "qualities and attributes required in a

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competent physician'' (Smith & Dollase 1999). CBME may also prepare students for lifelong learning by increasing their involvement in making decisions about and tracking their own learning. CBME models provide a focus on reflective and developmental activities, which Candy and colleagues (1994) place at centre of learning activities; this is in keeping with one of the purposes of higher education, which is to foster the development and transformation of students, providing tools to assist them in continuing to learn (Toohey 1999). CBME also appears to provide a seamless link between levels of medical education by using authentic experiences based in professional life.

A clearly articulated framework of practical, real-world objectives provides a rare opportunity for students to develop a clear pathway toward relevant competencies. Many previous curricula have relied on a layering of experiences that do not always build on one another and are not linked through a comprehensive framework. Further, the focus of CBME on authentic professional practice should prepare students for their early postgraduate years. This does not mean only intern training, but rather, as Hamilton has stated (1999), preparation for "the mature role of the professional, the quality of care provided and the contribution to health services."

Despite these advantages, CBME models raise a number of issues in the areas of design, assessment, and systemic factors, all of which will have an impact on undergraduate teachers and learners. These concerns are discussed in the following sections.

## Design issues

CBME curricula are designed to include a series of activities, each of which should contribute to the achievement of explicit, agreed outcomes. Once these outcomes are clearly delineated, curricular components designed to foster the acquisition of "enabling skills" and of knowledge can be structured in a logical sequence. Enabling skills may relate to a number of competency outcomes; for example, in the CanMEDS model, communication skills in a group setting could relate to the competencies required by the Communicator, Manager, or Collaborator roles (ten Cate 2006). The relationships between roles should be reflected across the curriculum blueprint and should always lead to one or more competency outcomes – without being atomized to mere checklists of behaviours. The test for relevant learning activities, then, is "What does this activity contribute to the student's outcomes?" An example of some additional reward for learning activities is discussed in the section below on systemic issues.

How do we visualize and communicate expected outcomes? Here, integration is the key. "A competency model starts with a focus on patient care and takes the additional step of determining which outcomes doctors *need* to have. It should focus on the end product or goal state of instruction" (Albanese et al. 2008). At its best, the competency approach can assist curriculum designers to identify characteristics of practitioners, including enabling skills and knowledge, "so that all dimensions of a performance should be … consciously developed" (Toohey 1999). Here we must encourage teaching

faculty to be explicit about teaching competencies that lie beyond the Medical Expert domain (e.g., teamwork, the CanMEDS Health Advocate competencies).

Concepts can be "packaged" differently at different stages of development or for different levels of expected outcomes. This allows us to articulate and review levels of expected outcomes for different stages of the undergraduate program. For example, the concepts and practice of health promotion will be designed differently for learners early in their undergraduate career (who might, for example, be required to describe principles) than for graduates in hospital practice (who might be asked to implement individual strategies). On a broader scale, the National Undergraduate Framework in the Netherlands articulates the CanMEDS model, originally designed for residency and beyond, in an undergraduate form (Herwaarden et al. 2009). Similarly, the Bridging Project in Australasia has described, within its "doctor as educator" theme, a vertically staged set of competencies for students, graduates and practitioners (Page et al. 2008).

Outcome frameworks specify the destination but not the mode of delivery. CBME does not mandate any particular teaching strategy or philosophy, and many methods (e.g., problem-based learning, case-based teaching) may continue within the CBME approach. However, some philosophical approaches are implicit in the demands of attaining competencies: student-centredness, active engagement, flexibility of design, constructive alignment of learning activities with assessments, and spiral development of concepts, knowledge, and skills (Biggs 1999) would all be needed for the effective implementation of CBME.

## Assessment issues

Assessment becomes clinically authentic once it relates to the graduate's actual performance of required clinical tasks. Competency frameworks allow for the development of an assessment matrix that relates each assessment task back to the relevant competencies. The assessment system must be configured to encourage students to focus on the learning tasks and outcomes intended as the product of the program. In this way it engages students, who tend to "define success as success in assessment" (Dreissen et al. 2007).

CBME drives a focus on validity in assessment, even at the potential expense of some reliability. The analysis of authentic real-time tasks by multiple observers, such as through MiniCEX or multisource feedback, moves us closer to the actual performance of a (student) clinician, thus enhancing the validity of the task. The nature of such real-time assessments is such that the assessment cannot be reproduced accurately: the circumstance, or patient, will have changed, potentially interfering with the measurement of reliability.

In moving through the progressive levels of mastery envisaged in CBME, both students and teachers need to identify areas where students are missing essential elements. One clear implication of this is the need to focus on frequent formative or "diagnostic" assessment tasks in preparation for the (fewer) summative tasks. Formative tasks should include interventions targeted to individual students or areas of

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weakness and should encourage more effective performance at subsequent summative assessments. Carefully designed formative assessments can reduce the summative load (Nieweg 2004) in addition to providing valuable data for course designers about problematic areas.

The application of two of the principles of good assessment – matching learning to assessment, and focusing on the end product of what a physician needs to know (Albanese et al. 2008) – often results in the adoption of a range of non-traditional assessments (Friedman Ben-David 1999). A variety of assessment tasks are required to yield the types of data that will allow a determination of whether the competencies across the framework have been satisfactorily achieved. Assessment should search for and map behaviours and knowledge that are generalizable across contexts and competencies. This notion is addressed in this issue in more detail by Holmboe and colleagues (pp. 676–682).

## Student learning issues

The student, not the discipline, is central to the learning process in a competency-based program. Achievement, not time, is the driver. Students are required to monitor their progress toward stated goals and elect to focus on those activities that will assist them to manage any deficiencies. This increases the student's responsibility for choosing learning activities. Many students will progress satisfactorily through the program and will be able to take advantage of its inherent flexibility, which allows them to study areas of interest in greater depth; by the same token, those who are struggling in a particular area will be directed by themselves, or their advisors, to undertake learning and assessment activities that will help them to improve and ultimately attain competence in those areas. This form of self-directed learning not only addresses weaknesses, but helps the student to develop the capacity for self-reflection and lifelong learning. The ability to identify and negotiate activities to meet a learning need is one that students will ultimately require throughout their professional careers.

The provision of electives and selectives creates opportunities for students to progress beyond mere adequacy in areas of interest or special skill. Selectives, which are chosen by the student from a menu of options, are highly compatible with the notion of a competency-based framework and may define additional levels of competency outcomes for students in certain areas, thus recognizing individual interest, capacity, and advanced achievement. The development of student-selected curricular components in the United Kingdom fits this model (Murdoch-Eaton 2004).

## Teacher issues

One of the strengths of professional education in medicine is learning in the workplace, where undergraduate and postgraduate teachers are the same people. As postgraduate training moves toward a more competency-based framework (as with the CanMEDs model and in the US Boards, for example), teachers will become familiar with the language and behaviours associated with learning and assessment in CBME.

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Competencies may be better understood by clinical teachers as accurate descriptions of their broader professional life. Clinical teachers, in particular, are well placed to provide feedback about the authentic nature of any framework and about the appropriate staging of achievement levels. On the other hand, basic science teachers may have more difficulty relating their discipline to eventual (likely clinical) outcomes.

The adoption of a competency-based approach implies the need for faculty development in the principles and practice of criterion-based assessment. Criterion-based assessment is not unique to CBME, but it is integral to the notion of a competency framework. Moving away from norm referencing will require new rating tools along with training in their effective use. A gradual introduction of changes to assessment tools can be helpful in this transition, but eventually examiners will be required to rely on the expressed criteria on the rating form to arrive at a judgment. Criterion-based marking has, perhaps, a longer history at the postgraduate (vocational) stage of training. Criterion referencing specifies the elements of a satisfactory performance in advance of the assessment. The transition from norm referencing to criterion referencing will not necessarily be smooth: initial increases in failure rates have been observed during the transition. These may relate to examiner calibration or to poor previous definition of course requirements, resulting in students missing out on either the breadth or the depth of topics that have (later) been deemed criterion standards (Carlson et al. 2000). Adequate examiner training remains the *sine qua non* of reliable observational assessment. The introduction of a new assessment tool or the alteration of an existing one should always flag the need for examiner redevelopment.

Teachers working within a competency-based program are faced with the increased complexity not only of delivering the "content" of their discipline but also of translating the principles of the competency framework into concrete learning tasks. A focus on competency outcomes implies a cross-disciplinary design that may cut across traditional institutional and departmental lines of reporting and funding. In this regard, CBME does not differ from other integrated curricula; however, its higher-order instructional design does demand new skills from teachers involved in course and program design groups. These new skills have implications for faculty development, including the need for training in design models and methods that have been reported to enhance the quality of course design (Hoogveld et al. 2005).

## Systems issues

Part of the discussion about CBME revolves around change management. For undergraduate programs, this management includes the institutional structures and timelines of universities as well as national professional accrediting bodies and professional associations. At the same time, internal change within medical schools must be managed. Departmental structures often reflect disciplinary perspectives that do not necessarily relate well to the notion of what a doctor *needs to know*. Recent work with postgraduate trainees and practitioners indicates a clear perception of the "need to know" materials that is sometimes at odds with that of

university-based teachers within a discipline (Koens et al. 2005). The management of this change is further explored in this issue by Taber and colleagues (pp. 687–691).

Defining outcome criteria and standards shifts the emphasis away from time to performance and capability. High-achieving students can be rewarded with accelerated programs. One example of this approach is the use of electives and selectives in pathology by capable students at the University of New South Wales (UNSW), Australia, to count toward advanced standing in their later College (Specialty) training in that discipline (see http://www.med.unsw.edu.au/med-web.nsf/page/Undergraduate+Students).

The use of outcome criteria may necessitate a longer period of study and training for students who do not reach the standard in the allotted time; some may require additional courses. Again at UNSW, a small number of students are required to undertake an additional course before joining the early clinical phase of the undergraduate program. This phase is designed with rotating terms so that a student can commence during any term. They may be able to catch up with their cohort, or may continue behind until they achieve a satisfactory result. Similar issues related to the timing of progression into internship or residency training can arise for trainees who are accelerated or delayed.

## Questions to explore

The implementation of CBME poses the same challenges as any curriculum change, along with some specific issues. All change requires resources, and health systems worldwide are under-resourced for their teaching role. Issues concerning the development of more effective learning strategies and the efficient deployment of resources remain high on the agenda for inquiry.

A range of research questions are raised by this approach to undergraduate medical education. How do competency standards relate to evolving clinical care and patient outcomes? Are there unintended costs associated with this approach? Does it actually liberate students from strict time constraints? Does the freedom from time-restricted programs provide a firm platform to enable students to excel?

As we look at the educational issues associated with CBME developments, we can ask whether the educational spiral, by which the student is repeatedly exposed to and builds upon concepts, will actually work. How can we link competency statements through the various stages of the life of a doctor?

If the notion of "living competencies" is part of our framework, how are outcomes viewed over time, and how do they adapt to changing circumstances in the community or health system? To what extent do competency frameworks represent a particular sociocultural and economic context?

## Conclusions

Considering CBME at the undergraduate level highlights a number of challenges for students, teachers, course designers, and managers. Many of these challenges are common to any major curriculum change, but some, such as the issue of time

versus achievement, are specific to CBME. An overarching outcomes framework allows a consistent approach to these changes and challenges, along with authenticity of experience and better alignment of educational activities and objectives through the continuum of medical education.

CBME does not specify particular learning strategies, formats, or approaches. As long as the competency statements are articulated at an "appropriate level of generality" (Harden et al. 1999), they can not only be adapted to the different phases of the undergraduate program but will be able to accommodate the integration of emerging topics and content. A regular review of societal and professional needs will allow curricula to mature, absorbing the competencies that may be required of future practitioners.

Many examples of CBME have derived from either major curriculum redesign or the establishment of new curricula. However, good practices such as those mentioned in this article can, or could, support CBME in the undergraduate environment. As curriculum evaluation and review cycles offer opportunities for change, and as new challenges arise, such examples can be employed and enhanced. We will then be able to use best practices in education that currently exist to move toward CBME in undergraduate curricula.

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