Competency-Based Medical Education: A Brief History and Primer

The following pages serve as a brief historical timeline of the move toward competency-based medical education (CBME) and assessment. It describes basic tenets of CBME as the foundation for the ACGME's accreditation model grounded in a continuous quality improvement and innovation philosophy (Nasca et al. 2012; Weiss et al. 2013) using the Core Competencies (Professionalism, Patient Care and Procedural Skills, Medical Knowledge, Practice-Based Learning and Improvement, Interpersonal and Communication Skills, Systems-Based Practice) and the Milestones as core components. Key dates to consider on this timeline include the approval of the six Core Competencies in 1999, the launch of the ACGME Outcomes Project in 2001, and the transition of the first phase of accredited specialties to the ACGME's current accreditation model (formerly referred to as the "Next Accreditation System"), including implementation of the Milestones in July 2013 (Nasca et al. 2012; Batalden et al. 2002).

Overview: Competency-Based Education (CBE)

CBE is not a new concept; it represents a form of outcomes-based education. Harden and colleagues (1999) defined outcomes-based education as:

> …*an approach to education in which decisions about the curriculum are driven by the outcomes the learners should display by the end of the training program. In outcome-based education, product defines the process. The educational outcomes are clearly specified and decisions about the content and how it is organised [sic], the educational strategies, the teaching methods, the assessment procedures and the educational environment are made in the context of the stated learning outcomes. (Harden, Crosby, and Davis 1999, p. 8)*

In fields outside medical education, it has been called competency-based education and training (CBET). CBET had much of its genesis in the teacher education reform movement of the 1960s (Elam 1971). This interest was spurred by a US Office of Education National Center for Education research grant program in 1968 to 10 universities to develop and implement new teacher training models that focused on student achievement (outcomes). From this early research and activity, interest in competency-based models within medical education began to grow. In 1971, Elam provided a series of principles and characteristics that continues to capture the essence of CBET.

Principles and Characteristics of Competency-Based Educational (CBE) Models

Principles	Characteristics
1. Competencies are role-derived (e.g., physician), specified in behavioral terms, and made public. 2. Assessment criteria are competency-based and specify what constitutes mastery level of achievement. 3. Assessment requires performance as the prime evidence, but takes knowledge into account.	1. Learning is individualized. 2. Feedback to the learner is essential. 3. Emphasis is more on the exit criteria (i.e., outcomes) than on the admission criteria (i.e., selection). 4. A systems approach is required to manage a training program. 5. Training is modularized.

4. Individual learners progress at rates dependent on demonstrated competence. 5. The instructional program facilitates development and evaluation of the specific competencies.	6. Both the learner and the program are accountable.

In medical education, competency-based models were first promoted for wide use by McGaghie and colleagues (1978) as part of a report to the World Health Organization. In that report, the authors defined the goal of CBME:

> *The intended output of a competency-based programme [sic] is a health professional who can practise [sic] medicine at a defined level of proficiency, in accord with local conditions, to meet local needs. (McGahie et al. 1978, 18)*

In the context of medicine, Carraccio and colleagues (2002) compared elements of the structure/process-based educational approach and the outcomes-based approach, which have been adapted in the table below:

Comparison of Structure/Process-Based vs. Competency-Based Programs

Educational Program Approach		
Variable	**Structure/Process**	**Competency-Based**
Driving force for curriculum	Content—knowledge acquisition	Outcome—knowledge application
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 measure focused	Multiple measures
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

Finally, Carraccio and colleagues (2002) also described a four-step process for implementing CBME: 1) identification of competencies (in the US, the six ACGME/American Board of Medical Specialties [ABMS] Core Competencies); 2) determination of competency components and performance levels (e.g., benchmarks and milestones); 3) competency evaluation; and 4) overall assessment of the implementation process.

In 2010, a group of international educators worked to "modernize" the definition of CBME and lay out the theoretical rationale for a CBME system. This group defined CBME as:

> *…an **outcomes-based** approach to the design, implementation, assessment, and*

*evaluation of a medical education program using an **organizing framework** of competencies. (Frank et. al. 2010, p. 641; emphasis added)*

Elaine van Melle and colleagues (2019) outlined five core components for CBME along with their associated practices, principles, and conceptual frameworks as follows:

Core Components of CBME: An Organizing Framework

Core Component	Practice	Principle	Competency-Based
	What the core component should look like in practice	*How the core component is supposed to work in practice*	*Why the core component should work according to theories, models, or best practices*
Outcome competencies are required for practice and are clearly articulated	Required outcome competencies are based on a profile of graduate and or practice-based abilities	Specifications of learning outcomes promotes focus and accountability	• Social accountability • Outcome-based education • Backwards design • Job task analysis
Competencies and their developmental markers are sequenced progressively	Competencies are organized in a way that leads to a logical developmental sequence across the continuum of medical education or practice	A sequential path supports the development of expertise	• Expertise theory • Entrustable professional activities • Surface and deep approaches to learning • Mastery learning
Learning experiences facilitate the developmental acquisition of competencies	Learning takes in settings that model practice, is flexible enough to accommodate variation in individual learner needs, and is self-directed	Learning through real-life experiences facilitates membership into the practice community and development of competencies	• Situated learning • Deliberate practice • Workplace-based learning • Professional identity formation
Teaching practices promote the developmental acquisition of competencies	Teaching is individualized to the learner, based on abilities required to progress to the next stage of learning	Development of competence is stimulated when learners are supported to learn at their own pace and stage	• Zone of proximal development • Constructive friction • Learner-centered apprenticeship • Coaching theory • Growth mindset
Assessment practices support and document the developmental acquisition of competencies	Learner progression is based on a systematic approach to decision making, including standards, data collection, interpretation, observation, and feedback	Programmatic assessment systems allow for valid and reliable decision-making	• Programmatic assessment • Formative assessment • Learning analytics

Ten Cate (2015) also explained that the core components framework is grounded in a "growth" mindset which:

- forms the basis for significantly redesigning assessment practices, instructional methods, and learning experiences (i.e., curriculum);
- focuses on promoting learner growth and development through frequent formative assessment (i.e., assessment for learning);
- provides rich feedback/coaching individualized to the learner and grounded in the desired competencies; and,
- provides rich and diverse learning experiences, steeped in clinical practice where learners can *stay as long as required.*

CBME explicitly recognizes that learners progress through the educational process at *different rates* within and across competencies. However, system constraints in US medical education create substantial challenges in designing flexible curricula to manage and effectively support this known variability in development among learners. In CBME, time is viewed as a *resource* and not an *intervention/measure.* Time is too often used as a proxy for competence. Shortening medical school education and graduate medical education (GME) is *not* the *primary* goal of CBME. Time should be used wisely and the amount of "training time" required should be based on outcomes. The core principles of CBME can still advance GME within "fixed" program lengths, designing outcomes-based flexibility within a residency/fellowship.

CBME requires robust assessment, especially ongoing, longitudinal assessment that enables faculty members to determine the developmental progress of the learner more accurately, as well as to help the learner through frequent feedback, coaching, and adjustments to learning plans (Holmboe et al. 2010; Kogan and Holmboe 2013). This characteristic is consistent with multiple and important educational theories in expertise, deliberate practice, and mastery-based learning (Ericsson et al. 2007; McGaghie et al. 2017; McGaghie et al. 2014). In fact, CBME and its core components are grounded in multiple evidence-based educational theories and methods.

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