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To cite this article: Eric S. Holmboe, Jonathan Sherbino, Robert Englander, Linda Snell, Jason R. Frank & on behalf of the ICBME Collaborators (2017) A call to action: The controversy of and rationale for competency-based medical education, Medical Teacher, 39:6, 574-581, DOI: 10.1080/0142159X.2017.1315067

To link to this article: http://dx.doi.org/10.1080/0142159X.2017.1315067

Published online: 09 Jun 2017.

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A call to action: The controversy of and rationale for competency-based medical education

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ABSTRACT

Although medical education has enjoyed many successes over the last century, there is a recognition that health care is too often unsafe and of poor quality. Errors in diagnosis and treatment, communication breakdowns, poor care coordination, inappropriate use of tests and procedures, and dysfunctional collaboration harm patients and families around the world. These issues reflect on our current model of medical education and raise the question: Are physicians being adequately prepared for twenty-first century practice? Multiple reports have concluded the answer is “no.” Concurrent with this concern is an increasing interest in competency-based medical education (CBME) as an approach to help reform medical education. The principles of CBME are grounded in providing better and safer care. As interest in CBME has increased, so have criticisms of the movement. This article summarizes and addresses objections and challenges related to CBME. These can provide valuable feedback to improve CBME implementation and avoid pitfalls. We strongly believe medical education reform should not be reduced to an “either/or” approach, but should blend theories and approaches to suit the needs and resources of the populations served. The incorporation of milestones and entrustable professional activities within existing competency frameworks speaks to the dynamic evolution of CBME, which should not be viewed as a fixed doctrine, but rather as a set of evolving concepts, principles, tools, and approaches that can enable important reforms in medical education that, in turn, enable the best outcomes for patients.

Background

Mary is a 75-year-old woman with heart disease and recurrent lung cancer. She has made it clear that she doesn’t want additional cancer therapy, but after presenting with shortness of breath and being diagnosed with bronchitis, she complies with several courses of antibiotics prescribed by three different physicians. Unfortunately, Mary feels worse. She feels more tired and has to stop frequently to catch her breath. She is very frustrated with her oncologist and primary care physician, who she says “just aren’t listening to me – and they don’t seem to talk to each other.” Finally, the primary care physician orders a chest CT scan that shows her cancer has advanced with bulky mediastinal adenopathy. He refers Mary to a surgeon for an endobronchial biopsy to “guide possible palliative therapy.” Since she has already declined further therapy for her cancer, Mary is confused about the need for the biopsy. After 8 weeks of multiple physician visits with three different physicians, she can barely get out of bed and has lost all appetite. Her elderly husband and children intervene independently and institute home hospice care. On initial hospice evaluation Mary is severely hypoxic and confused; oxygen and medications are ordered for comfort and to reduce the anxiety from her shortness of breath. Mary dies at home 7 days later. The biopsy was never performed, and none of her physicians were engaged in her hospice care.

A myriad of stories like Mary’s lies behind the rise of competency-based medical education (CBME) (McGaghie et al. 1978; Frank et al. 2010a; Frenk et al. 2010). No single measure could capture all the deficiencies in Mary’s care, which cut across multiple competency domains at the level of the individual physician, the team and the
system. Errors in diagnosis and treatment, communication breakdowns, poor care coordination, the inappropriate use of tests and procedures, and dysfunctional collaboration all amount to inadequate care for this patient in her particular situation.

In 1978, McGaghie et al. described a rationale for an approach to medical education founded on the acquisition of defined competencies. “The intended output of a competency-based program,” they wrote, “is a health professional who can practice medicine at a defined level of proficiency, in accord with local conditions, to meet local needs” (McGaghie et al. 1978, p. 18). Roughly 10 years later, a doctor’s strike in Ontario, Canada, would catalyze a public conversation about what patients should expect from their physicians (Neufeld et al. 1993, 1998). This ultimately led to the first iteration of the CanMEDS Roles by the Royal College of Physicians and Surgeons of Canada in 1996 (Frank et al. 1996; Frank 2005). Recognizing similar needs and issues, the Accreditation Council of Graduate Medical Education, the American Board of Medical Specialties, the Institute of Medicine, the General Medical Council of the United Kingdom, the Royal Australasian College of Surgeons, the Dutch College of Medical Specialties, and other national professional entities produced competency frameworks (Batalden et al. 2002; IOM 2003; ten Cate 2007; General Medical Council 2013; RACS 2015). These frameworks were created to address the growing recognition that health care was too often unsafe and of poor quality and that medical education systems were not producing physicians with the abilities needed to meet the complexities of modern practice. The era of solo practice was waning; the era of team-based care, rapidly evolving practices, quality reforms and patient-centeredness had arrived. The substantial gap between practice and education resulted in the realization among policy-makers worldwide that reforms in undergraduate, graduate and continuing medical education were urgently needed. Despite this impetus for reform, many would agree that while William Osler would not recognize the health care system of today, he would, sadly, still recognize the medical education system (Sherbino & Frank 2014).

Historians may look back at the last 5 years as transformative. In 2010, the International CBME Collaborators, a group of medical educators and leaders convened by the Royal College of Physicians and Surgeons of Canada, produced a series of articles on the history, concepts, and challenges to the implementation of CBME across the continuum of medical training (Campbell et al. 2010; Frank et al. 2010a, 2010b; Harris et al. 2010; Holmboe et al. 2010; lobst et al. 2010). In the same year, another international group published a position paper in the Lancet on the need to accelerate transformation in medical education, grounded in the principles of CBME (Frenk et al. 2010); meanwhile, on the 100th anniversary of the Flexner report (Flexner 1910), the Carnegie Foundation released recommendations for medical education that embraced many of the key principles and goals of CBME (Cooke et al. 2010). A few years later, Ludmerer’s Let Me Heal (2015) further codified calls for change. Since 2010, several medical education systems have adopted and implemented sweeping CBME-based changes across the medical education continuum on a national scale (Nasca et al. 2012; Frank et al. 2015).

In essence, CBME as a philosophy and educational strategy has reached the stage of widespread implementation. However, as the momentum of the CBME reforms has increased, so have criticisms of the movement. Given the growing number of CBME initiatives on a large-scale, the ICBME group was recently re-constituted and expanded to reflect on the critical forces driving and challenging change. The core lesson from early efforts to implement CBME is the realization that it is not, and should not be, a uniform or static ideology. Rather, it is an amalgam of principles and approaches that must constantly evolve to meet a primary aim: to achieve better health and health care for all through more effective medical education.

**What is meant by “CBME”?**

CBME is an approach to and philosophy of designing the explicit developmental progression of health care professionals to meet the needs of those they serve. Among its fundamental characteristics (see Table 1) is a shift in emphasis away from time-based programs based solely on exposure to experiences such as clinical rotations in favor of an emphasis on needs-based graduate outcomes, authenticity, and learner-centeredness (Frank et al. 2010b; Carraccio et al. 2016).

### Criticisms of CBME

Table 2 outlines arguments for and against CBME. The criticisms of CBME can be loosely grouped into five themes: concerns about reductionism; lack of evidence; impact on existing systems; implementation challenges; and philosophical or ideological concerns. Before delving into the arguments in support of CBME, it is important to examine some of the thoughtful criticisms that have been brought forward.

### Concerns about reductionism

One of the more unfortunate misconceptions about CBME is that it leaves little room for the “art” of medicine, for meaningful professional identity formation, and for the development of complex, higher-level competencies (Grant 1999; Huddle & Heudebert 2007). A common refrain is that not all that is measurable is meaningful, and not all that is meaningful is measurable. Others have labeled CBME a checklist or “tick-box” approach to medical education while...
other models of what the desired outcomes of training should look like and to enable the use of group processes to make entrustment decisions (Andolsek et al. 2015; Hauer et al. 2015). We also know that criterion-based approaches, such as milestones and entrustable professional activities (EPAs), currently being used in a number of countries, are challenging to implement in educational programs (Swing 2007; ten Cate & Scheele 2007; Philibert et al. 2014; Tekian et al. 2015; ten Cate et al. 2016). Although some variation is to be expected – all faculty have idiosyncrasies, biases, and cognitive limitations (Govaerts et al. 2011; Yeates et al. 2013; Gingerich 2015) – the degree of acceptable variation in assessment should be “bounded” (Kogan et al. 2014; Gingerich 2015). For too long the medical education system has seen unfettered variation as a good thing, to the detriment of patients and trainees (Kogan et al. 2014; Lau et al. 2015). Holism and reductionism both have a place in medical education; the issue is when and how to apply these interconnected philosophies appropriately.

**Lack of evidence for CBME**

Some have pointed to the lack of evidence for the CBME approach, especially regarding the lack of traditional psychometric validity and reliability evidence. (Norman et al. 2014; Dewan et al. 2015). Related to the psychometric argument is the concern that work-based assessments, critical...
to the CBME model, are simply not up to the task of producing statistically justified high-stakes decisions (Norman et al. 2014; Tekian et al. 2015). However, psychometric assessment instruments have long suffered from numerous limitations, and faculty have also struggled with the concept of criterion-referenced versus norm-referenced approaches to the assessment (Kogan & Holmboe 2013; Gingerich 2015). In addition, the amount of sampling required to “sign off” on every competency needed for independent practice (assuming this is even necessary; it is not endorsed by the CBME movement) can be daunting from a psychometric perspective (Norman et al. 2014).

Systems implementing CBME, with its greater focus on the needs of the patient, population and system, have encountered significant challenges when they apply conventional psychometric methods (Schuwirth & van der Vleuten 2011; Cook et al. 2015; Hodges 2015). This experience has sharpened the focus on work-based assessment and prompted a return to narrative and group process as part of a program and system of assessment (Holmboe et al. 2006; Holmboe et al. 2010; van der Vleuten et al. 2012; Hodges 2015). However, we are not suggesting that we simply “throw out psychometrics.” The psychometric paradigm has served the medical education enterprise well and will continue to do so into the future, but in the longer term systems will need assessment approaches that account for uncertainty and complexity. For example, one of the criticisms of script concordance testing is the lack of a psychometric theory to deal with the embedded uncertainty in the testing process (Lineberry et al. 2013). Yet any clinician will tell you that he or she spends a significant proportion of every work day in the land of uncertain choices and tradeoffs.

In the twentieth century, the individual was the primary frame of reference for high-stakes assessment; in the twenty-first century, it’s the health care team. Competent health care providers do not work in isolation and can no longer (if they ever could) carry all necessary knowledge and skills in their head (Lingard 2009; Del Fiol et al. 2014; Ludmerer 2015). We have entered the interprofessional, technology-supported century of medicine (Chesluk & Ludmerer 2015). We have entered the interprofessional, technology-supported century of medicine (Chesluk & Ludmerer 2015). The psychometric paradigm is ill-suited for interprofessional, complex care, and it struggles with issues such as context, distributed cognition within interprofessional teams, and the use of technological aids such as clinical decision support. The question before us is where and how psychometrics fits into a complex system to help educators and policy-makers make good decisions about advancing learners and maintaining the workforce. It is interesting that the two countries that rely most heavily on high-stakes standardized testing (the United States and Canada) have consistently ranked at the bottom of overall medical-care quality reports by the Organization for Economic Co-operation and Development (OECD) and the World Health Organization (WHO); perhaps it is no surprise that CBME has taken a strong hold in both countries (Mossialos et al. 2015).

Making the most of time: impact on existing systems

Few issues engender more passion in medical education reform than the role of time. Two major challenges account for this. The first is the uncomfortable reality that many teaching institutions have become overly dependent on learners to deliver care services, which means that variable rates of progression through a program can create havoc with respect to learners’ availability to meet service needs (Ludmerer 2015). Also, certain graduate medical education (GME) financing systems, such as those in the United States and Canada, are time-based (Eden et al. 2014).

The second challenge is that time is used as a proxy measure of competence. Time is an indirect measure of experience. The duration of training has been refined, mostly unconsciously, to enable an adequate quantitative experience. However, it is unreasonable to assume that such a crude metric can ensure competence, or that all learners will progress at the same rate. This is not to say that time and quantity are irrelevant: recently, ten Cate outlined the “false dichotomy” that has crept into debates concerning time-based versus competency-based learning, noting that learners need a certain amount of time and experience to achieve the desired outcomes (ten Cate 2015). That being said, the major problem with the current model of education is that time has been used as an organizing framework, when it should be viewed as resource to manage wisely (Frank et al. 2010b).

For example, Bernabeo et al. (Bernabeo et al. 2011) looked at the impact of educational transitions, (i.e. moving from rotation to rotation) among a group of internal medicine residents. The results were sobering. Residents and non-physician health care professionals reported multiple problems with these transitions, including the challenge for learners to acclimate within new clinical Microsystems, the failure of faculty to appreciate the dysfunction occurring during acclimation on their service, and the harm experienced by admitted patients during the process. By centering programs on clinical and educational outcomes, CBME seeks to address these negative consequences of time-based frameworks for learning and patient care. (Batalden et al. 2002; Batalden & Davidoff 2007; Holmboe & Batalden 2015).

Evaluation and implementation challenges

Almost no one disputes that implementing CBME-based programs is challenging, or that today’s contexts of medical education and clinical practice are fraught with complexity. However, medical education can draw lessons from implementation science (McGaghie 2011) and complex program evaluation models (Pawson & Tilley 1997; Craig et al. 2008; Mayne 2011). Evaluation of programmatic change will have to recognize that the work of revising, refining, and improving our medical curricula and assessment approaches is never done. Research and evaluation models that recognize complexity must also embrace the notion that context matters a great deal and cannot be effectively addressed through the randomization associated with traditional biomedical research methods. To be sure, evaluation of CBME in a longitudinal, iterative process is essential and is a responsibility of all organizations implementing medical education reform.

Philosophical and ideological concerns

For some critics, CBME is radical, untested, and unnecessary. Others have pointed to political pressure to use CBME
not only to produce more competent physicians but also
to do so in less time (Whitehead et al. 2011). This has led
to doubts about the educational or societal benefit of
CBME innovations and concerns about the ability to deter-
mine whether someone is ready for unsupervised practice
early (Huddle & Heudebert 2007; Norman et al. 2014).
The irony is that there isn’t much evidence to support the
traditional systems that have been in place for over a cen-
tury. There is, however, abundant evidence that the status
quo isn’t serving us well (IOM 2003; Di Francesco et al.
2005; Cooke et al. 2010; Crosson et al. 2011; Eden et al.
2014; Ludmerer 2015). Some have noted that we shouldn’t
implement CBME reforms until they have been fully proven
(Dewan et al. 2015). There are several problems with this
argument. First, the rapid and ongoing changes in health
care science and delivery demand more flexibility and a
“continuous quality improvement” mindset for medical edu-
cation. Second, policy-makers are demanding transforma-
tive change in light of the uneven quality and safety of
current health care, cost pressures, the aging of popula-
tions, emerging diseases, and the advent of personalized
medicine.

Tensions and reconceptualization are a normal part of
scientific progress, as we know from Thomas Kuhn’s sem-
inal work, The Structure of Scientific Revolutions (Kuhn
1962). Tensions arise when existing paradigms can no longer
explain new findings or provide meaningful solutions to
the changing conditions. In many ways, CBME has forced
medical education systems to confront difficult truths
regarding quality and safety, thereby forcing a reexamina-
tion of established approaches, such as psychometric-driven
assessment approaches and time-based programs.
Questions from the public and from policy-makers, as to
how to improve medical education to better meet the pub-
ic’s needs, are legitimate. The important point is to use
criticisms of CBME as useful feedback to improve imple-
mentation and avoid pitfalls, but not as an excuse to main-
tain an unsatisfactory status quo. Bridging the quality and
safety gap with improvements in medical education should
be the focus moving forward, and appropriate stewardship
of public resources in preparing health professionals is a
legitimate public policy concern (Weinberger 2011).

Why the strong and continued global interest in
CBME?

Why does CBME continue to grow as a global movement
despite the criticisms that have been leveled at it? History
would suggest that inertia alone might be enough to block
innovation. The question brings us back to where we
started: the primary goal of medical education is to prepare
a health professions workforce that can meet the needs of
patients and populations (McGaghie et al. 1978; IOM 2003;
This is much more than just being “transparent” about what
medical training should contain (Norman et al. 2014).
Ironically, much of the criticism of CBME makes scant men-
tion of the quality and safety issues currently plaguing
health care, often taking a traditional, physician-centric
view of medical training despite abundant evidence that
traditional approaches are not meeting current needs. In
fact, the word “patient” rarely appears in a number of com-
monly referenced criticisms of CBME.

Longitudinal data from the OECD and WHO continue to
highlight the consequences of dysfunctional health care
and persistent deficiencies across the globe (Mossialos et
al. 2015). Many countries are confronting the challenge
to the capacity of their health care systems posed by the
accelerated aging of their population. At the same time,
countries in Africa and the Near East are struggling mightily
with shortages of skilled health care workers for all age sec-
tors, as was tragically exemplified in the recent Ebola out-
break. Finally, there is a growing concern among many
nations about escalating health care costs, most strikingly
in the United States (Weinberger 2011; Mossialos et al.
2015). The most recent US Institute of Medicine report
highlighted the urgent need for innovation to the struc-
tures, locations, and processes of GME (Eden et al. 2014).
The focus on outcomes in CBME, while unquestionably dif-
ficult, better aligns the missions of medical education and
health care delivery. Given this underlying state of concern
regarding medical education systems around the world,
how can we leverage CBME and the associated criticisms to
move educational transformation forward?

A tipping point in implementation?

Medical education reform should not boil down to an
“either/or” choice between competing theories; rather, it
should blend theories and approaches to optimize the
quality of training. In fact, CBME already represents an
amalgam of theories and exemplifies the dictum that no
single theory will be sufficient for something as complex as
training a health care professional for twenty-first century
practice (Frank et al. 2010b). For example, the rise of con-
structivist, socio-cultural, and newer cognitive theories are
actually helping to move CBME implementation forward
(Lingard 2009; Durning & Artino 2011; Gingerich et al.
2014; Durning et al. 2015; Gingerich 2015). There are no hard and
fast “rules” of CBME that should prevent an educational
program from applying multiple theoretical perspectives to
design, implementation, and evaluation.

Ironically, the strength of the outcomes approach is its
inherent recognition of the need to incorporate new theo-
ries as they emerge and mature to continually improve
training programs. Implementing CBME-based models will
always be an iterative, dynamic process (Pawson & Tilley
In CBME, outcomes are paramount, while the tactics used
to achieve them are chosen from the best available. We are
now entering a new phase of CBME implementation, per-
haps best highlighted by the deliberate use of milestones
and EPAs in a number of national medical education frame-
works that did not exist at the beginning of the compe-
tency movement. This is one healthy sign that the CBME
approach is in fact learning and adapting.

Conclusions

CBME is evolving to meet health care and educational sys-
tem needs; rather than a fixed doctrine, it is a set of con-
cepts, principles, tools, and approaches that can enable
transformation. CBME must be implemented wisely, with
keen attention to context. For many countries, such as Canada, Singapore, and the United States, hybrid models of training are being implemented because of logistical and financial constraints, so that the principles and tools of CBME are being applied within fixed-time models. CBME embraces continuous quality improvement through iterative learning cycles to better learn what works, for whom, in what circumstances, and why. Implemented effectively and dynamically, CBME can help all training programs do better for the patients and populations they serve. For future Marys, it will mean the delivery of patient-centered care by an effective interprofessional team that makes accurate diagnoses, maximizes meaningful engagement in life-and-death decisions, coordinates care, and attends to comfort and the needs of family members. We must also recognize that, as some of the criticisms of CBME reflect, change is hard because it is mostly about loss: loss of identity and loss of tremendous personal investment in traditional models of medical education (Heifetz & Linsky 2002). Ironically, CBME can help to “bring back” many things that we should embrace – most notably bedside rounds, direct observation, and faculty judgment – but in a more rigorous and systematic manner. Mary would have welcomed a more coherent and attentive health professions team during her clinic visits or at her bedside, helping her to make important decisions. Medical education programs must produce graduates who are prepared to provide the high-quality twenty-first century care that all patients deserve.

Disclosure statement

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

Eric Holmboe is employed by the ACGME and receives royalties for a textbook on assessment from Mosby-Elsevier. Resources and secretariat support for this project was provided by the Royal College of Physicians and Surgeons of Canada.

Glossary

Competency-based medical education: An outcomes-based approach to the design, implementation, assessment, and evaluation of medical education programs, using an organizing framework of competencies. (Frank et al. 2010b)

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