

BEME Scoping Review Study Protocol

1. Cover Sheet

Making sense of competency-based medical education (CBME) literary conversations: A BEME scoping review

Review Group Members

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2. Glossary of Terms:

Narratives/discussions/views/positions/literary conversation: A written account or discussion about CBME, the implementation of CBME, and/or the real/anticipated outcomes of CBME.

Competency-based medical education (CBME): A transformation in medical education from time-based curriculum and assessment to training that focuses on the demonstration of specific competencies; is learner-centered; and provides learning experiences that align with the ever-evolving needs of society.

Quantitize: To translate, transform, or convert qualitative data into numeric form. Quantitizing qualitative data, such as narrative and themes, is a staple in mixed methods research.

Triple C: The version of CBME designed by the College of Family Physicians of Canada (CFPC). The 3C's represent Comprehensive scope of learning/training experiences, Continuity of care to patients over the lifespan and Continuity of education, and training experiences that are Centered in the actual practice of family physicians.

Competence-by-Design (CBD): The version of CBME designed by the Royal College of Physicians and Surgeons of Canada (RCPSC) that balances learner-centered training and the demonstration of competencies and defined stages of progression using a nationally developed specialty specific framework of entrustable professional activities and CanMEDS associated milestones.

3. Abstract:

Competency-based medical education (CBME) is a transformation in curriculum and assessment approaches for physician education and training. Initially proposed in the 1970s, CBME received increased attention in the early 2000s by educators, clinicians and policy makers as a way to address concerns about physician preparedness and patient safety in a rapidly changing healthcare environment. In CBME, there is a shift from providing time-based curriculum and assessment to an approach centered on the demonstration of specific competencies. CBME was introduced as a way to support the development of physician competence through training that prepares them to know how to do the right thing, in the right way, at the right time – in other words, to be competent, safe, and effective practitioners. Opinions and perspectives around this shift in medical education vary and, to date, a systematic search and synthesis of existing information has yet to be undertaken. The aim of this review is to present readers with up-to-date information on the literary conversations surrounding CBME to advance the conversation about opportunities and threats to this approach to education, and uncover areas that are prime targets for medical education research. The systematic mapping of data for this review will use mixed methodology, specifically thematic analysis and conventional and summative content analysis, which will support the development and integration of central themes and quantizing content to produce a descriptive numerical summary.

4. Background:

The way in which health care systems function is a product of various factors; however, in recent years, medical education has been at the forefront of initiatives to improve patient care outcomes. Evidence suggests current educational methods are suboptimal to support the development of physicians who are able to provide care that meets the needs of a complex, diverse and ever-evolving community [1-4]. Further, some evidence suggests that medical errors in diagnosis and treatment, as well as poor communication and collaboration among medical team members, may be remedied through changes in medical education and training [1-4]. This evidence has fueled an urgent need for change in academic institutions worldwide [5-11]. Ultimately, proposed transformations in medical education and training are anticipated to improve patient care outcomes as a byproduct of improved physician competence.

Competency-based medical education (CBME) is a transformation in physician education and training approaches. Initially proposed in the 1970s, CBME received increased attention in the early 2000s by educators, clinicians and policy makers as a way to address concerns about physician preparedness and patient safety in a rapidly changing healthcare environment [6, 12-14]. The transformation to CBME shifts from curriculum and assessment from time-based, as a proxy for competence, to an approach that focuses on the demonstration of specific competencies [14]. CBME was introduced as a way to ensure that physicians are trained in a way that prepares them to know how to do the right thing, in the right way, at the right time – in other words, to be competent, safe, and effective practitioners. CBME shifts focus away from primarily medical knowledge, and instead envisions physician training to encompass knowledge as well as patient-centered care, communication, professionalism, critical thinking, teamwork, advocacy, and appropriate use of limited resources [1-3, 5-11, 13, 14]. For the purpose of this

scoping review and based on published literature on the topic, the definition of CBME is as follows:

A transformation in medical education from time-based curriculum and assessment to training that focuses on the demonstration of specific competencies; is learner-centered; and provides learning experiences that align with the ever-evolving needs of society [8].

Despite the intended positive impact of CBME, it is not without criticism [5]. For example, one of the main criticisms of CBME is that there is a lack of evidence that this transformation in curriculum produces better physicians [5, 15, 16].

Initiatives to improve medical education began in the United Kingdom with Tomorrow's Doctors, which was developed by the General Medical Council (GMC) in 1993, centered on designing curriculum around outcomes and appraising the performance of trainees through methods to support the learning trajectory toward competence. In the United States in 1998, the Accreditation Council for Graduate Medical Education (ACGME) developed an initiative to improve the competence of medical residents as a way to improve patient care outcomes and adapt to changing healthcare systems [17]. In Canada, the College of Family Physicians of Canada (CFPC), the regulatory body for family physicians, formally implemented Triple C, a version of CBME in 2010 [18]. The Royal College of Physicians and Surgeons of Canada (RCPSC), the regulatory body for all other specialties, developed their own version of CBME, called Competence by Design or CBD and entered the early implementation stages of curriculum transformation in 2017 [19]. This planned curriculum shift in specialty training, particularly implementation initiatives in Canada and the USA within the past 10 years, has increased the literary conversations supporting and critiquing the impact of CBME, along with prospective implementation and piloting of CBME in other parts of the world, such as Southeast Asia and India [20, 21].

The proposed BEME scoping review aims to synthesize existing literature, which has not been undertaken systematically to date. Given that the goal of CBME is to produce better physicians who will provide better healthcare, it is important to look objectively at the literary conversations around CBME to ensure decisions that are made about the future approaches to physician training are aligned with the goals of improved patient outcomes and social accountability. Further, by gaining a better understanding of the various views surrounding the implementation of CBME, medical education researchers will be better positioned to develop research and program evaluation questions and methods to examine these positions in more detail.

5. Scoping review framework

The stages of development for this scoping review align with the framework pioneered by Arskey & O'Malley (2005) along with enhancements to this framework by Levac, Colquhoun & O'Brien (2010) and Peters et al. (2015; 2017) [22-25]. We have approached these frameworks as guides that are dynamic, flexible, and adaptable to one's context. As such, the framework

detailed below accurately reflects the processes and stages undertaken specifically for this review.

Framework Stage 1: Identifying the research question and alignment of objectives

The aim of this scoping review is to explore, summarize, and quantize literary conversations in published literature surrounding the medical education curriculum transformation to competency-based medical education (CBME). This includes literary conversations about implementing CBME in undergraduate medical education, postgraduate medical education, and continuing professional development and medical education.

Research question: What are the literary conversations surrounding the shift to CBME for medical education and training in published literature?

Objectives:

- 1) Summarize, through rigorous methodology, the various views of CBME in published literature
- 2) Illustrate the evolution of these literary conversations and views about CBME over time
- 3) Identify areas requiring future program evaluation and/or research

Framework Stage 2: Consultation with information scientists

To identify relevant published literature to include in this scoping review, we consulted with an information specialist (RF) to support a comprehensive and systematic search of electronic databases, networks, and relevant organizations. In addition, the information scientist (RF) required an initial table of inclusion and exclusion criteria to facilitate the identification of relevant sources. The systematic search strategy for our scoping review is based on terms used to identify various forms of CBME that have been implemented internationally. Further, the scoping review team provided the information specialist (RF) with a development test-set of 50 published articles that are expected to be included in this scoping review. Variations of keywords were searched using query signs and use of ‘OR’ and ‘AND’ Boolean operators.

Keywords: CBME; Competence by Design; Milestones Project; Triple C; Competency-Based Medical Education; Outcome-Based Education.

Framework Stage 3: Pilot database search an iterative process to develop study selection criteria

In the pilot scoping search for literature, conducted by the team’s information specialist (RF), the search strategy yielded 26,000 records. This yield was based on using keywords CBME, clinical competence, competency-based medical education, problem-based learning/framework/project, competency based, competence by design, learner cent*, OBE, problem based learn*, and Triple C, health professions learners. From a feasibility and resource point of view, we needed to refine

our search strategy to ensure this undertaking was manageable without compromising the breadth of information captured. Upon closer examination as a team, we found that many of the articles retrieved did not align with our research question and objectives for this scoping review.

After refining the search strategy by limiting population and outcomes of interest, 5,758 articles were identified with 95% of our development test-set of expected articles included in this yield.

Using the preliminary inclusion and exclusion criteria, four members of the team examined 40 randomly selected articles that were provided by the information scientist (RF) for study selection. This was an iterative team process with literary conversations, consensus, and refinement of the inclusion and exclusion criteria. This approach aligns with the scoping review framework enhancements proposed by Levac, Colquhoun, & O'Brien (2010) [23]. Indeed, aligned with Arskey & O'Malley's (2005) [22] framework, increased familiarity with the literature led the two reviewers (DMH & LB) to refine the inclusion and exclusion criteria further during primary screening and applied to all articles to determine the relevance to the research question. Below is Table 1 with final criteria used for study selection for this scoping review.

Table 1. Study selection criteria:

	Include	Exclude
Date Range	<ul style="list-style-type: none"> ● 1978 - 2018 	<ul style="list-style-type: none"> ● Literature prior to 1978
Literature Type	<ul style="list-style-type: none"> ● Primary research, reviews ● Opinion pieces including commentaries, editorials, columns, and letters 	<ul style="list-style-type: none"> ● Studies in languages other than English ● Video summary; study protocol
	<ul style="list-style-type: none"> ● Books, book chapters, book reviews; column ● Conference abstracts; proceedings ● Theses; dissertations ● English language 	
Study Methodology	<ul style="list-style-type: none"> ● All methodologies 	<ul style="list-style-type: none"> ● N/A
Study Design	<ul style="list-style-type: none"> ● All designs 	<ul style="list-style-type: none"> ● N/A
Setting	<ul style="list-style-type: none"> ● All countries 	<ul style="list-style-type: none"> ● N/A
Participants/ population	<ul style="list-style-type: none"> ● Physician learners (medical students, residents, physicians) 	<ul style="list-style-type: none"> ● Non-physician learners

Interventions	<ul style="list-style-type: none"> • All interventions 	<ul style="list-style-type: none"> • N/A
Outcome(s)	<ul style="list-style-type: none"> • Rationale/theoretical underpinnings of competency-based medical education (CBME) • Narratives about effectiveness/ineffectiveness/challenges/benefits/enablers/barriers of CBME • Synonyms for CBME: outcome-based learning; competency by design (CBD); Triple C; individualized trainee learning plans; competency-based education (CBE); milestones project; entrustable professional activities (EPA); workplace-based assessment (WBA); Outcome Project • Narrative discussion/conclusion about CBME • CBME specific to physician training 	<ul style="list-style-type: none"> • Outcomes outside of inclusion criteria • Digital portfolio systems • Competency technologies (development, implementation, evaluation) • Explicit/implicit curricula • Predictive validity of practice selection scores • CBME curriculum mapping • Development of specialty specific competencies/tasks/milestones • Competency-based frameworks • Feedback quantity and quality • Modernizing Medical Careers (MMC) • CBME for healthcare professionals that are not physicians (e.g. pharmacists, nurses) • Simulation training outcomes; simulation-based mastery • Development of accreditation agencies; assessment/validation of accreditation • Assessor judgement (outside of CBME purpose/concept)

Framework Stage 4: Planned approach to evidence searching and selection

Protocol Search Methods Prepared by:

Robin M Featherstone (RF), MLIS, Alberta Research Centre for Health Evidence, Alberta SPOR SUPPORT Unit KT Platform

Tara Landry (TL), MLIS, peer-reviewer of the Medline search strategy.

Search Methods

We have searched the following electronic databases: Ovid Medline, Ovid Embase, Web of Science, OvidPsychInfo, OvidERIC, and ProQuest News & Newspapers for publications in

English from 1978 to present. Our search utilized subject headings (e.g., MeSH) and keywords to combine concepts for clinical competency and medical education. Our search strategy was designed by an information specialist (RF) and peer-reviewed by a second research librarian (TL). Please see Appendix A for the peer-reviewed Medline strategy.

Additional search sources include ProQuest Dissertations & Theses Global, and websites of the College of Family Physicians of Canada, the Royal College of Physicians and Surgeons of Canada, and the BEME Collaboration. To account for publication bias and ensure comprehensive coverage of available CBME literary conversations that are published, we also searched Google and Google News.

All searches were executed by the information specialist (RF), who removed duplicate records in EndNote X7 (Clarivate Analytics) and converted the results to Microsoft Excel for primary (title and abstract) screening.

Search limitations:

As with any search strategy, there are limitations. Firstly, the search for this scoping review is tightly focused on the research question and the search strategy reflects capturing pertinent information to answer this question. As such, we are not aiming to capture broader medical education literature and this may be viewed as a limitation. More specifically, CINAHL was included in our initial search strategy that yielded 26,000 records. When we refined our population from health professions learners to physician learners to produce a more manageable and relevant yield, CINAHL was excluded. Scopus was not included in the search strategy based on resource constraints. While this is a limitation, the information specialist (RF) working with our team indicated that 99.8% of articles from our test-set were captured by the first two databases searched (Medline and Embase). In addition, websites for two regulatory bodies in Canada, the Royal College of Physicians and Surgeons of Canada and the College of Family Physician of Canada, were searched for relevant articles. The information specialist (RF) has indicated that the Google search captured articles from other regulatory bodies internationally. The listing of the College of Family Physicians of Canada and the Royal College of Physicians and Surgeons of Canada was a precautionary measure related to timeliness of publications located on the respective websites; however, these articles were also captured through the Google search. We are unable to use other Internet search engines due to resource constraints, and this may be a limitation of this review. Secondly, while our scope was very broad at the outset, the yield of 26,000 records was unmanageable based on human and financial capital required to produce a scoping review within a reasonable timeframe. Further, this unmanageable yield was likely to grow rapidly because of recent shifts to CBME and the subsequent surge of literary conversations on this transformation in medical education and training. This would require frequent updating to the search, which may result in producing the scoping review at a point in the overall literary conversation that is neither timely nor relevant. As such, we have placed parameters around our search strategy, in consultation with an information scientist (RF), which will provide sufficient data to systematically map the crux of the literary conversations on CBME. Only including documents in English may be perceived as a limitation of this scoping review, and this parameter was decided in consideration of human and financial capital,

including time, which may be required to accurately translate non-English documents. Despite this potential limitation, there have been studies examining the effect of English-language restriction in reviews, which have not confirmed evidence of systematic bias with this approach [26-28]. We realize there are limitations to the scope and that some literary conversations may have been excluded; however, we are undertaking this work with the knowledge and transparency that this scoping review will act as a stepping stone for future researchers to examine the broader CBME conversation.

Framework Stage 5: Procedure for selecting, extracting and charting the evidence

Study Selection:

Two reviewers (DMH and LB) will conduct primary screening of articles independently, examining title and abstract and identifying records that meet inclusion criteria. Upon completion of primary screening, one reviewer (LB) will determine the degree of agreement using Altman's Kappa. Any disagreements will be resolved through discussion by two members of the team (DMH and LB), with a third member of the team available to support consensus, when necessary. The included articles will then undergo secondary screening by two reviewers (DMH and LB), which is a review of the full-text, to identify records that meet inclusion criteria, while also logging reasons for exclusion from the review. Any disagreements will be resolved through discussion by two members of the team (DMH and LB), with a third member of the team available to support consensus, when necessary.

Also aligned with the scoping review framework of Peters et al. (2015; 2017), the selection process of articles will be recorded and displayed through a PRISMA Extension for Scoping Reviews (PRISMA-ScR) flow diagram [29].

Data extraction:

Two reviewers (DMH and LB) will begin data extraction with a test-set of 10 articles to develop a systematic approach. Once the approach to data extraction is refined, one reviewer will extract data from all of the records and reviewer two will audit a minimum of 25% of the extractions. Anticipated data to be extracted is illustrated in Table 2. Any disagreements will be resolved through discussion by two members of the team (DMH and LB) and any unresolved issues will be taken to the broader team for discussion and consensus.

Table 2. Anticipated data charting fields

1. Author
2. Publication date
3. Journal Name
4. Setting (Country)
5. Participants/Target Group (e.g., undergraduate, postgraduate, continuing professional development/medical education)
6. Polarity of the literary conversation (i.e., positive, negative, mixed, descriptive)
7. Literature type
8. Key points of the literary conversation(s) (i.e., positive, negative, mixed, descriptive)
9. Primary Outcome(s) of the study, if applicable (i.e., dependent on literature type and study design)
10. Secondary Outcome(s), if applicable
11. Disclosure of funding
12. Disclosure of conflicts of interest

Since we are interested in the literary conversations surrounding CBME, we have opted to include other (grey) literature, such as commentaries, debates, and news articles that are published and, as such, will not be assessing the quality of these publications. This aligns with published frameworks and guidelines that indicate a quality appraisal of the literature is not a mandatory step of scoping reviews [22-25, 29].

Framework Stage 6: Synthesis of evidence

There are two main parts to this scoping review, which will use mixed methods and the integration of qualitative and quantitative data to illustrate current literary conversations about CBME. The first part of this scoping review is to uncover the various literary conversations about CBME from 1978 to 2018 systematically through thematic analysis; and, the second part is to illustrate the evolution of these literary conversations over time with increased implementation of CBME through a descriptive numerical summary of data by quantizing qualitative findings using conventional and summative content analysis. The team envisions systematically mapping CBME literary conversations into categories and quantizing this qualitative data to develop an illustrative trend line from 1978 – 2018, but this goal is dependent on data retrieved. The synthesis of evidence from articles will be qualitative and quantitative, which will lay the foundation for a summary of views surrounding CBME as a transformation to medical education with the goal of publishing this review in *Medical Teacher*. Any deviations to this protocol will be carefully documented, including date and explanation of changes.

6. Translation into practice

Through the development of a BEME Scoping Review, we are aiming to advance the conversation around CBME from criticism/praise/uncertainty to action through identifying

opportunities for research and evaluation. It is through research and evaluation that we will be able to draw a bridge between medical education transformation and patient care outcomes by bringing light to areas where medical education researchers can focus their efforts. For example, if one of the narratives claims that CBME lacks evidence of effectiveness in reducing physician error with patients, researchers may be able to examine data sources containing this information prior to and after implementation of CBME. Further, a better understanding of the literary conversations surrounding CBME will provide medical learners, educators, and policy makers with insight about both the concerns and the hopes that exist in the community of practice about CBME. Having this information will assist in change management, as well as in making decisions about where, when, and whether to adopt CBME, or about what are the best forms of CBME that facilitate improvement in physician competence. Based on existing literature and improved patient care outcomes as an anticipated outcome of the medical education and training transformation, this will be one area to monitor longitudinally during and after implementation of CBME. This scoping review is a foundational step to future exploration of CBME outcomes.

7. Project Timetable

Task	March 2019 – March 2021																								
	Mar '19	Apr '19	May '19	Jun '19	Jul '19	Aug '19	Sept '19	Oct '19	Nov '19	Dec '19	Jan '20	Feb '20	Mar '20	Apr '20	May '20	Jun '20	Jul '20	Aug '20	Sept '20	Oct '20	Nov '20	Dec '20	Jan '21	Feb '21	Mar '21
Work with Information Scientist on search strategy	█																								
Finalize topic registration and submission to BEME	█																								
Full search of the literature	█	█																							
Develop and submit BEME Protocol	█	█																							
Primary screening of ~10,300 records + consensus decisions			█	█	█	█	█	█	█	█	█	█	█												
Secondary (full-text) screening of 665 records + consensus decisions											█	█	█	█	█	█	█	█	█						
Data charting/extraction															█	█	█	█	█	█					
Data analysis and synthesis																		█	█	█	█	█	█		
Review writing																							█	█	█
Submit BEME review																									█

8. Conflict of interest statement

All authors report no conflicts of interest whether academic, institutional, political, financial, personal, or other.

9. Plans for updating the review

We expect to submit the scoping review within two years of the initial search. In the event the scoping review requires more time and is not submitted within this two-year timeframe, the team's information specialist will run the search strategy detailed in this protocol in the month prior to writing up the findings from the included narratives on CBME, advancing the date limitations to present date. This will allow for a search of the latest literature that may be relevant for inclusion in the scoping review. For a future update of this scoping review, we anticipate more publications on CBME alongside implementation in the next three to five years, and undertaking an update will be of value to the medical education community at this time.

10. Changes to the protocol

The scoping review examining literary conversations surrounding CBME will follow the methodology outlined in this protocol. Minor changes to this protocol will be carefully documented, including reasons for deviating from the protocol as well as the date. Major deviations to the protocol will be submitted to BEME for approval.

11. Protocol checklist

The development of this protocol has been prepared using the BEME Systematic Review Protocol Checklist to ensure essential components of the review methodology are included.

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Appendix A: Medline Search Strategy

Database: Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Daily 1946 to November 08, 2018 Strategy:

- 1 CBME.tw,kf. (99)
- 2 competence by design.tw,kf. (14)
- 3 Milestones Project*.tw,kf. (29)
- 4 Triple C.tw,kf. (66)
- 5 or/1-4 [Coordinated concept for CBME] (204)
- 6 Competency-Based Education/ (3553)
- 7 competenc* based.tw,kf. (2971)
- 8 ((framework* or project*) adj2 outcome*).tw,kf. (2166)
- 9 OBE.tw,kf. (708)
- 10 outcome* based*.tw,kf. (4584)
- 11 or/6-10 [Combined MeSH & text words for competency based] (12884)
- 12 Clinical Clerkship/ (4670)
- 13 Curriculum/ and (clerk* or clinical or CME* or CPD* or medic* or PGME* or PGY* or physician* or residen* or UGME*).tw,kf. (33341)
- 14 exp Education, Medical/ (153523)
- 15 Educational Measurement/ and (clerk* or clinical or CME* or CPD* or medic* or PGME* or PGY* or physician or residen* or UGME*).tw,kf. (16707)
- 16 Faculty, Medical/ (12210)
- 17 Models, Educational/ and (clerk* or clinical or CME* or CPD* or medic* or PGME* or PGY* or physician or residen* or UGME*).tw,kf. (4458)
- 18 Program Evaluation/ and (clerk* or clinical or CME* or CPD* or medic* or PGME* or PGY* or physician or residen* or UGME*).tw,kf. (20391)
- 19 Schools, Medical/ (24250)
- 20 Specialization/ and (curricul* or educat* or knowledge or practice or program* or school* or student* or teach* or train*).tw,kf. (8976)
- 21 Teaching/me, st and (clerk* or clinical or CME* or CPD* or medic* or PGME* or PGY* or physician or residen* or UGME*).tw,kf. (1563)

- 22 ((clinical* or medic* or post grad* or postgrad* or PGY*) and (residenc* or resident*)).tw,kf. (69156)
- 23 ((curricul* or educat* or program* or school* or student* or teach* or train*) adj3 (clinical or CME* or CPD* or medic* or PGME* or PGY* or post grad* or postgrad* or physician* or residen* or UGME* or under graduate* or undergraduate*)).tw,kf. (229769)
- 24 (educ* and (med* or health*)),jw. (34736)
- 25 or/12-24 [Combined MeSH & text words for med ed] (392527)
- 26 and/11,25 [Combined concepts for competency based & med ed] (4129)
- 27 or/5,26 [CBME Concept] (4237)
- 28 limit 27 to english (4096)
- 29 limit 28 to yr="1978-Current" (4075)
- 30 remove duplicates from 29 (4074)