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REPORTS OF ORIGINAL INVESTIGATIONS

Faculty perspectives on the transition to competency-based medical education in anesthesia

Perspectives du corps professoral sur la transition vers une formation médicale fondée sur les compétences en anesthésie

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Abstract

Purpose *Canadian residency programs are transitioning from time-based to competency-based medical education (CBME). The anesthesia department at Dalhousie University enrolled its first CBME cohort in 2016, one year prior to national anesthesia rollout. Early implementation allowed a unique opportunity to examine faculty anesthesiologists' experiences with the transition.*

Methods *Using Rogers' Diffusion of Innovations (DOI) theory, we conducted a qualitative interview study. In-depth interviews were held with faculty members (n = 12) at varying stages of innovation adoption (e.g., innovators/early adopters, early/late majority, and laggards) at two time points: onset of CBME and one year later. Interview data were analyzed based on the DOI promoting factors: relative advantage, compatibility, complexity, trialability, and observability.*

Results *Relative advantage: Early adopters believed CBME had benefits over the traditional curriculum, while laggards viewed the change as an unproven paradigm shift. CBME was compatible with the values of early adopters, who appreciated resident accountability for learning. Trialability, the degree to which an intervention can be trialed and modified, arose with the early/late majority group, who described an organic process of adaptation over the year. All groups mentioned the need for observable results. Innovators and early adopters were confident CBME would improve learner experiences. Early/late majority noted expedited skill acquisition and improved quality of feedback. Laggards believed observable results would take many years to emerge, if ever. The early/late majority group showed the most progress toward adoption over the study time period, moving from skeptical optimism to active investment.*

Conclusion *Targeted interventions for faculty uptake should emphasize the trialability and observable results achieved over time. These efforts may have the greatest impact in the early/late majority group.*

Résumé

Objectif *Les programmes de résidence canadiens font la transition d'une formation médicale fondée sur le temps vers une formation médicale fondée sur les compétences (FMFC). Le département d'anesthésie de l'Université Dalhousie a accueilli sa première cohorte de FMFC en 2016, soit un an avant son déploiement national en anesthésie. Cette mise en œuvre précoce nous a donné une occasion unique d'examiner les expériences des anesthésiologistes du corps professoral en ce qui touchait à la transition.*

Méthode *En nous fondant sur la théorie de diffusion de l'innovation (DOI) selon Rogers, nous avons réalisé une étude qualitative par entretiens. Des entretiens approfondis des membres du corps professoral (n = 12) se situant à divers stades de l'adoption de l'innovation (par ex., innovateurs / adeptes précoces, majorité précoce/tardive, et récalcitrants) ont eu lieu deux fois, soit au lancement de la FMFC et un an plus tard. Les données d'entretiens ont été analysées selon les facteurs de promotion de la DOI : l'avantage relatif, la compatibilité, la complexité, la testabilité et l'observabilité.*

Résultats *Avantage relatif : Selon les adeptes précoces, la FMFC comportait des avantages par rapport au*

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programme de cours traditionnel, alors que les récalcitrants ont perçu le nouveau cursus comme un changement de paradigme non prouvé. La FMFC était compatible avec les valeurs des adeptes précoces, qui ont apprécié l'imputabilité des résidents en ce qui touchait à leurs apprentissages. La testabilité, soit la mesure dans laquelle une intervention peut être testée et modifiée, a augmenté dans le groupe majorité précoce/tardive, qui a décrit un processus naturel d'adaptation au fil de l'année. Tous les groupes ont fait part du besoin de résultats observables. Les innovateurs et les adeptes précoces étaient confiants que la FMFC améliorerait les expériences des résidents. Le groupe majorité précoce/tardive a remarqué une acquisition accélérée des compétences et une meilleure qualité des rétroactions. Les récalcitrants étaient d'avis qu'il faudrait des années avant que des résultats observables soient manifestes – s'ils apparaissent. Le groupe majorité précoce/tardive est celui ayant le plus progressé vers une adoption au cours de la période à l'étude, allant d'un optimisme sceptique à un engagement actif.

Conclusion *Les interventions ciblées vers l'adoption par le corps professoral devraient mettre l'accent sur la testabilité et les résultats observables atteints au fil du temps. Ces efforts pourraient avoir le plus grand impact dans le groupe majorité précoce/tardive.*

Canadian postgraduate medical education is transitioning from traditional time-based to competency-based medical education (CBME).[1] Anesthesia has been at the forefront of this transition with the University of Ottawa implementing the first anesthesia CBME program in July 2015[2,3] and Dalhousie University following in July 2016. The Royal College of Physicians and Surgeons of Canada (RCPSC) mandated all anesthesia programs to adopt CBME in July 2017. The driving principle behind the RCPSC Competence by Design is that competence must be shown and documented rather than assumed to have been achieved through time in a program.[1]

Faculty engagement is crucial to CBME. While there is a growing body of literature on CBME in general, there is a dearth of information regarding the faculty experience in transition from time-based medical education to CBME. Fraser *et al.* outlined a comprehensive faculty development program for CBME in Ottawa[3] but did not discuss the faculty experience in curriculum transition. Early implementation in anesthesia at Dalhousie University provided a unique opportunity to examine the experiences of faculty anesthesiologists in transitioning from time-based education to CBME.

We selected Rogers' Diffusion of Innovation (DOI) theory[4] as a theoretical framework to explore faculty experience during CBME implementation. DOI has been successfully used across disciplines and has previously been applied to medicine,[5,6] with the acknowledged limitation that it may fail to account for social factors and available resources. DOI theory is comprised of four elements: the innovation (an idea, behaviour, or product that is perceived as new), communication (the channels through which individuals share information about the innovation), time (the time taken to adopt an innovation by both individuals and groups), and the social system (the boundary for the diffusion process). Rogers additionally describes five normally distributed groups within a population—innovators (2.5%), early adopters (13.5%), early majority (34%), late majority (34%), and laggards (16%)—based on their willingness to adopt a new innovation. The spectrum ranges from innovators (those who create) to laggards (the holdouts). The key focus of the theory is on adoption of innovations within a social system. According to Rogers, new ideas diffuse through a population by the stages of awareness, decision to adopt, initial use, and sustained use.

Diffusion of innovation postulates that the following factors may influence the rate of innovation adoption. Relative advantage is the perception that the intervention is an improvement on the status quo. Compatibility is how well the intervention correlates with the adopters' fundamental values, experiences, and needs. Complexity is the perception that the intervention is easy to use. Simple, well-defined interventions are more likely to be adopted. Trialability is whether the intervention may be trialed and modified, as trials tend to promote confidence in the intervention. Finally, observability is the extent to which the results of the intervention are visible to others. Charismatic leaders and visible interventions promote discussion, favouring adoption of the intervention.

The current study examines the diffusion of CBME (innovation) among anesthesia faculties (social system) over the first year of implementation (time). Understanding that, like most social systems, members of medical faculties are heterogeneous in their readiness and willingness to adopt innovations, we studied the transition to CBME among faculty members in three adopter categories: innovators and early adopters, early and late majority, and laggards. Analyses focus on exploring the influence of relative advantage, compatibility, complexity, trialability, and observability on CBME adoption over time and within these groups.

Methods

Research setting

In Dalhousie anesthesia department, the ground for curriculum renewal was well-established prior to the CBME transition. In 2013, a Curriculum Renewal Committee was developed to rejuvenate the existing academic curriculum. This committee began with four members but over the course of three years, additional staff and residents became engaged in curriculum renewal and the committee grew to 17 members.[A] Academic curriculum renewal raised awareness of medical education, CBME, and concepts such as entrustable professional activities, which are units of professional activity a trainee can be entrusted to achieve.[7] In preparing for CBME at Dalhousie University, departmental members were kept abreast of curriculum changes through grand rounds, news bulletins, staff workshops on feedback and assessment tools, resident information sessions, and informal person-to-person discussions.

Although the fundamental components of the Dalhousie anesthesia program were not altered (e.g., the formal academic curriculum continued) during the transition to CBME, changes were made to the program structure and many assessment tools were added. The new program structure became:

Transition to discipline (first two months)
Foundations (post-graduate years [PGY] 1-2)
Core (PGY 3-4)
Transition to practice (PGY-5)

Rotations are grouped for relevance rather than keeping the traditional off-service intern year (e.g., otolaryngology off-service followed anesthesia airway rotation, obstetrics followed by obstetrical anesthesia). Residents submit evidence of achieving competencies to an online e-portfolio. This process requires high-quality faculty assessments and therefore engagement with the new structure. This study was undertaken to understand the factors influencing faculty adoption of CBME with the goal of informing other programs making this transition.

Design

This study was designed to describe in-depth the faculty experience of the transition to CBME. A qualitative approach was selected to inform an understanding of how individuals make sense of their experiences within a social system.[8] The theoretical lens was Rogers' DOI. Ethical approval was granted at Dalhousie University (REB: 2016-3854).

Participant recruitment

To ensure representation of the full range of Rogers' adopter categories, two researchers professionally familiar with the Dalhousie anesthesia department independently assigned all staff members (n = 90) to one of three truncated groups (innovators and early adopters were combined into one category, as were early and late majority, and laggards made up the final group). Agreement between the raters was strong with > 98% concordance. In the case of disagreement, consensus was achieved through discussion. Following category assignment, staff were grouped by category and numbered. To minimize bias, a random number generator was used to select four candidates within each group who would be invited to participate. Participant lists and scheduling communications did not identify group membership. This purposive sampling technique[9] sought to explore a wide range of perspectives within a specific group with similar characteristics (i.e., in terms of education and profession). The initial target of 12 participants (four in each adopter category) was selected because this has been considered an adequate number of participants for data saturation when examining shared perception and experience.[10] Twelve participants are also sufficient according to all but one of Malterud's[11] recommendations regarding the "information power" of a sample. Specifically, the aim of this study was narrow (to describe a particular time frame of a specific transition within an individual program), the sample was dense (sharing characteristics that are highly specific, with some variations to be explored), theory was employed in its planning and analysis, and the quality of dialogue was expected to be high. Saturation is reached when the same themes recur without the emergence of new interpretations and/or perspectives. Therefore, recruitment beyond the initial 12 (four in each adopter category) participants would have been required if new themes continued to emerge in the interviews.

Data collection

Interviews were conducted at two time points: the first set at the onset of CBME and the second set one year after implementation (July 2016 to September 2017) to examine change in adoption over time. All interviews were conducted face-to-face in quiet, private locations (e.g., hospital and academic offices) that were convenient to participants. A semi-structured interview guide was used at

[A] *Dumbarton, et al*. Building a culture of learning: curriculum renewal in an anesthesiology residency program. Unpublished manuscript 2014 (personal communication).

both time points (Appendix), with slight modification of the guide for the second interview set. The same guide was used to interview all participants regardless of adopter category. Interviews (30 min on average) were conducted by two researchers to encourage consistency across interviews and to provide an opportunity for reflexivity through peer debriefing. They were recorded and transcribed verbatim by a third-party professional transcriptionist who de-identified comments and assigned a study ID that could be linked back to the participant's adopter category for the purpose of analysis.

Data analysis

The three researchers – a resident and senior staff member from the department and an evaluation specialist in postgraduate medical education – coded the transcriptions to identify emergent themes. This diversity of perspectives allowed for meaningful investigator triangulation, a process in which multiple researchers examine the data independently and then compare their findings to develop a thorough understanding of the phenomenon and support study trustworthiness.[12] After all researchers had independently examined the interview transcripts, made detailed notes on emergent themes and linkages with DOI, meetings were held to discuss emergent themes and to assess consistency across the three coders. This process occurred following each set of interviews and finally to compare the two sets of interviews, identifying changes over the study time period. Discussion of whether thematic saturation had been attained was also a focus of these meetings. Finally, following each meeting, a grid was created for each time point including adopter category and themes. It was populated with interview content and analyzed for observable change in thinking among participants.

Results

All researchers agreed that thematic saturation had been attained within the original target sample of 12 participants. The sample consisted of five female (42%) and seven male staff members and the average number of years on staff was 15. This is a good representation of the overall staff population, which is 35% female with an average of 14 years on staff. Findings are presented according to theme, with quotes to illustrate each finding.

Relative advantage

Innovators/early adopters were confident CBME would improve training because they believed it would create awareness of the curriculum, draw focus to medical education, and help residents who may be struggling.

> *"I think that CBME will pick up [problems] sooner and hopefully get people back on track sooner" – Innovator/Early Adopter (Interview 1)*

Early/late majority participants perceived potential advantages but were not convinced the benefits of CBME would outweigh required effort.

> *"I don't think there will be huge differences to be honest. I think the residents are currently trained well." – Early/Late Majority (Interview 1)*

Laggards were not convinced there would be any advantage over the traditional system.

> *"You better be dealing with a system that's pretty profoundly broken to be able to defend reinventing." – Laggard (Interview 1)*

By the second time point, the early/late majority group had embraced a more favourable view of CBME citing improved organization of rotations, better performance in junior residents, clarity around expectations, and improved quality of feedback.

> *"I find that they [residents] are possibly more independent sooner and so they work through a lot of the basics already and are now at the point, even in their first year, of fine-tuning things. Maybe faster than in the previous program." – Early/Late Majority (Interview 2)*
>
> *"The new residents expect reasonable feedback. And they also need it for their portfolios. So, I think that drives my behaviour…the quality of my feedback, I am pretty sure, has improved." – Innovator/Early Adopter (Interview 2)*

Innovators and early adopters continued to champion the relative advantage or CBME and laggards were unconvinced:

> *"My concerns are that in order to do this well, it is going to require a significant amount of investment of time in a world where I don't feel like we have much time already. So, for myself, I don't know. It depends on the day whether I feel like investing that effort. But from a system point of view, I still remain a skeptic." – Laggard (Interview 2)*

Compatibility

Compatibility is the correlation of the innovation with existing values, past experiences, and the needs of adopters. Laggards value evidence-based interventions

and presumed that CBME was change for change's sake. They recalled past experiences with new curricula both in anesthesia and in education in general.

> *"I've been around long enough to see education stuff change for the sake of change as opposed to it really being broken." – Laggard (Interview 2)*

Compatibility with existing values featured more heavily in initial interviews with innovators/early adopters and early/late majority, who valued self-directed learning and therefore found CBME to be consistent with their views on education. By the time of the second interview, self-directed learning also permeated the views of some laggards.

> *"I am getting more specific and direct requests from what their expectation is for the day and the evaluation… that has changed the way I interact with the residents to some extent. Definitely in a little more focused way with respect to teaching and observation of their skills." – Laggard (Interview 2)*

With regard to CBME's compatibility with faculty needs, participants expressed concerns regarding increased burden of paperwork for staff in CBME in the initial interviews. Although all groups were somewhat uneasy about changes to workload, this feeling was most predominant among the early/late majority:

> *"I think it is going to be a lot of paperwork for somebody." – Early/Late Majority (Interview 1)*

Nevertheless, by the second interview set, concerns around staff workload were alleviated with the realization that the residents are the drivers of CBME.

> *"And as staff, it is true that life really hasn't changed that much." – Early/Late Majority (Interview 2)*

Complexity

The complexity of an intervention may hinder its uptake. During the initial interviews, only laggards commented on the complexity of CBME.

> *"They got together and within a relatively short window of time a relatively small number of people got to craft a plan that had us split the whole universe on its head." – Laggard (Interview 1)*

After one year of functioning within the program, there was improved understanding by all three groups with credit being given to engaged residents as key to CBME.

> *"It seems like the students that are in this are motivated. They know what they need to do. And they are taking the incentive and are taking their learning in their own hands and presenting it to staff." – Innovator/Early Adopter (Interview 2)*

Trialability

Trialability is the degree to which an innovation can be experimented with on a limited basis and modified over time.[4] Participants in both the innovator/early adopter and early/late majority perceived CBME as a concept that could be tried, trusting that adjustments and improvements could be made as time progressed.

> *"I know that in education we do a lot of cycling. So, part of me thinks we'll try this one and see how that goes." – Early/Late Majority (Interview 1)*

At the second time point, curriculum changes were described as subtle and progressive.

> *"I would say it is very smooth and very subtle. I don't think it is hugely different. I was probably one of those people that gave a lot of feedback anyway. I am not necessarily someone who will let people slide through easily." – Innovator/Early Adopter (Interview 2)*

Laggards, however, perceived CBME as a re-invention of medical education at both time points. This perception might prevent laggards from making even small strides toward adoption.

> *"And I do believe that this dramatic revision of our training system is somewhat self-serving. It really is. And I am all in for making our system better. But…every single residency program, every single medical school across the entire country – that's not trying to tweak something, that's reinventing something." – Laggard (Interview 1)*

Observability

Observability is the degree to which an innovation's benefits are visible to others. Clear successes of an innovation help to promote adoption by those outside the innovator/early adopter group. Participants in all groups expressed concerns about the lack of evidence for CBME, although the innovators/early adopters did not feel constrained this limitation.

> *"There is no proof that this type of assessment is going to give you a better resident at the end of all this and so I still think this is early days." – Innovator/Early Adopter (Interview 2)*

Laggards considered proof necessary prior to implementation.

> *"If we were to invoke a new therapy based on such preliminary, albeit enthusiastic support, they would take our licenses away." – Laggard (Interview 2)*

Regardless of whether or not benefit has been proven, engagement of key players (innovators) promotes observability. Efforts to communicate and build support for CBME were noted by all three groups.

> *"I think there has been a lot of effort to keep staff informed about how it is being rolled out. I think that's been good. Whether staff has taken full advantage of that opportunity, I would say not all staff including the one sitting in front of you have, but I think there has been lots of communication and that has been good." – Laggard (Interview 1)*
> *"We have a good group who are organized and setting it up for us. Lots of communication, pep talks, and reminders." – Early/Late Majority (Interview 2)*

In addition to the CBME implementation team, anesthesia residents played a crucial role in observability of the intervention. Engagement by residents helped increase staff awareness and understanding of CBME; indeed, the residents were perceived as the drivers.

> *"I would just look over the shoulder or grab one of the residents I was working with to show me what kinds of things they are expected to do." – Early/Late Majority (Interview 2)*
> *"The clinician sometimes doesn't necessarily know what they need to be teaching that day and it is up to the resident to tell them and to ensure that they have learned it. It is really like a role reversal where the emphasis is on the student and not the teacher." – Innovator/Early Adopter (Interview 2)*

There was also hesitation regarding future cohorts, as the initial class had self-selected Dalhousie with full knowledge of the CBME program. Participants were unsure if this motivation would apply once CBME were no longer a choice.

> *"I think this year was no problem for us. Because we really advertised that this is what we are going to do, and this is what you are going to be responsible for and if people did recognize that this wouldn't fit with their personality, they knew this was not the place to be. And when we did our interview process, we specifically looked for residents who we felt would be able to responsible and advocate for themselves and stay on top of things. My concern is that when the whole country goes competency-based for everything, where are those people going to go?" – Innovator/Early Adopter (Interview 1)*

Discussion

Despite initial concerns about increased workload for staff and perceived lack of evidence for CBME, there was movement in perspective between the two interview time points, particularly for the early/late majority group, who expressed more favourable views one year in. Diffusion of Innovations theory can be generally employed to improve uptake of an innovation and can be differentially applied to adopter categories to optimize diffusion.[13] Our findings suggest that efforts to increase uptake of CBME in general may have the most immediate impact on the early/late majority group—the innovators are already invested, and the laggards are slow to progress in their views—whereas the early/late majority are most mutable. This is not to suggest, however, that laggards should not be a target of interventions to encourage innovation adoption. Our findings suggest that this group began to understand the complexity of CBME and to appreciate the idea of self-directed learning over the study time period. Communications to simplify the innovation and publicize the known (tested and observed) benefits of self-directed learning may encourage quicker adoption within this group.

Our findings also suggest a number of general strategies for facilitating the diffusion and support of CBME among faculty members, which has been characterized as essential for its success.[14] Efforts to increase relative advantage of the innovation, for instance, could entail highlighting the shortcomings of the traditional model and promoting successes of the new program as they occur. The latter would also boost the observable benefits of CBME, a strategy known to facilitate adoption. Leaders should also appeal to the values of faculty members in communications about CBME, promoting its compatibility with self-directed learners, and the responsibility to train competent physicians. Finally, to foster perceptions of trialability, emphasis should be placed on continuous quality improvement to reassure faculty members that components of the program will be monitored and evaluated for continuous improvement.

Participants identified the communication strategy by the implementation team as being particularly helpful in smoothing the transition from time-based to CBME. This included grand rounds, news bulletins, workshops for staff on feedback and assessment tools, resident information sessions, and informal person-to-person discussions. Timely and repetitive communication reinforced relative advantage and decreased perceived complexity of the intervention. In

particular, the personalized approach of innovators speaking with colleagues was valued. This, specifically, targets observability. As there will be no results from the intervention in terms of outcomes until the initial cohort completes their training, the observability of the intervention itself was key. Engagement by residents was also identified as key to success. Daily interactions with the CBME residents shaped staff anesthesiologists' understanding and views of the program, again decreasing perceived complexity.

This study does not provide a full application of Rogers' DOI theory. Rather, it focuses primarily on the time and social system components of the theory. Further, it may not illustrate the full range of adopter viewpoints because adopter categories were collapsed (e.g., early and late majority groups were combined). This was done for ease of categorization and interpretation but imposes some limits on how findings can be interpreted. For instance, findings suggested that the early/late majority category made the most progress toward adoption of CBME, but to fine tune targeted interventions within this group it may have been helpful to delineate between early and late groups. Given that the combined group represents a large proportion of the population (64%, according to Rogers), more specific recommendations could be considered highly valuable.

Study limitations also include inbuilt difficulty in generalizing findings from qualitative research to other contexts. Although the technique employed in this study was ideal for ensuring adequate inclusion of the three adopter categories, purposive sampling can be prone to researcher bias and limit the group to whom these findings can be generalized. Furthermore, despite confidence that saturation was reached in this set of interviews, the potential to uncover different themes with additional interviews has been acknowledged by a number of qualitative researchers.[15] Finally, it is important to acknowledge that CBME is a mandated innovation, which brings different implications for diffusion than consensus-driven innovations. A lack of perceived control over the decision to implement CBME could have exacerbated the resistance of laggards, while perceived input into the process enjoyed by early adopters and innovators may have widened the gap between these groups. Finally, this particular study may have an additional limitation because the early introduction of CBME in the Dalhousie anesthesia department was selected for residents who voluntarily chose this program and were possibly more primed for success than a cohort who lacked that choice.

Conclusion

Transition to CBME is now a requirement in anesthesiology training in Canada and is being introduced across disciplines. Using the DOI framework, we identified the target group for whom interventions have the highest yield as the early/late majority. The communication strategy to implement CBME was well received. Resident participation is key to success of CBME, but staff expressed concerns around the burden of responsibility that lies with residents. All groups cited apprehensions about the lack of evidence for CBME and the resources required for its implementation. Future research is needed to clarify advantages and disadvantages of CBME over traditional time-based programs. Qualitative research of resident experience in CBME would also be valuable.

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Appendix

Semi-structured interview guide – Interview 1 (pre-CBME implementation)

1. Please describe your experience, if any, of competency-based medical education (CBME)? Have you been involved in CBME for the Department of Anesthesia? If so, please describe your involvement.
2. What is your understanding of the implementation of the CBME curriculum within the Anesthesia residency training program?
3. What is your opinion of the program transition? Do you have any concerns regarding the novelty of this type of educational program?
4. What do you perceive to be the benefits of CBME?
5. What tangible results, if any, do you expect to see from the shift to CBME in the short term? What do you expect in the long term?
6. What elements do you identify as being essential in an anesthesia training program? For instance, training hours, OR experiences, structured teaching sessions.

7. What do you perceive to be the potential gaps in experience or learning with the implementation of CBME?
8. How could your experience of this transition be improved?
9. Do you have anything else you would like to add?

Semi-structured interview guide – Interview 2 (One-year post-CBME implementation)

1. Since our last interview how has your involvement in CBME for the Department of Anesthesia changed?
2. Has your understanding of the implementation of the CBME curriculum within the Anesthesia residency training program changed?
3. What is your opinion of the program transition thus far? Do you have any concerns regarding the its implementation?
4. What do you perceive to be the benefits of CBME? Have these changed since our last interview?
5. What tangible results, have you seen from the shift to CBME thus far? What do you expect in the long term?
6. What do you perceive to be the potential gaps in experience or learning with the implementation of CBME?
7. How could your experience of this transition be improved?
8. How has your opinion of the CBME curriculum changed since our last interview?
9. Do you have anything else you would like to add?

CBME = competency-based medical education.

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