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REVIEW ARTICLE/BRIEF REVIEW

Review article: Leading the future: guiding two predominant paradigm shifts in medical education through scholarship

Article de synthèse: Préparer l'avenir: guider les changements de deux paradigmes prédominants en éducation médicale grâce à l'érudition

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Abstract

Purpose *The purpose of this article is to consolidate some of the key concepts about scholarship in education related to the specialty of anesthesiology. We frame the discussion on two paradigm shifts in medical education, i.e., competency-based education and lifelong learning, and the scholarly approaches to lead these paradigm shifts in anesthesiology.*

Principal findings *Conventional medical education is being challenged by a shift from time-based education to competency-based education. This potential shift will also create a continuous need to foster a culture of lifelong learning in contrast with the traditional compartmentalized model of undergraduate, postgraduate, and continuing medical education. The specialty of anesthesia has the capacity to lead these changes by enhancing scholarship in education locally and nationally. The promotion of scholarship in education necessitates the creation of infrastructure and accountability frameworks to show return on investment. High-quality scholarship in medical education requires a solid rationale and, ultimately, a demonstrable benefit to patient care.*

Conclusion *Accountability of lifelong learning to established competency frameworks seems inevitable. Anesthesiology is one of only a few specialties that can truly protect faculty from clinical responsibilities in favour of scholarship pursuits. With appropriate support for scholarship in education, anesthesiologists have an opportunity to lead these paradigm shifts.*

Résumé

Objectif *L'objectif de cet article est de renforcer quelques uns des concepts clés concernant l'érudition en éducation en rapport à la spécialité de l'anesthésiologie. Nous cadrons la discussion sur deux changements de paradigmes en éducation médicale, à savoir l'éducation basée sur la compétence et l'apprentissage permanent, et sur les approches scientifiques pour mener ces changements de paradigmes en anesthésiologie.*

Constatations principales *L'éducation médicale conventionnelle est remise en cause par un passage d'une éducation reposant sur le temps d'apprentissage à une éducation reposant sur les aptitudes. Ce changement potentiel créera aussi la nécessité d'encourager constamment une culture d'apprentissage permanent par opposition au modèle traditionnel compartimenté de l'éducation médicale: premier cycle, postgraduée et continue. L'anesthésie est une spécialité qui a la capacité d'être à l'avant-garde de ces changements en améliorant l'érudition en éducation, sur le plan local et sur le plan national. La promotion de l'érudition en éducation nécessite la création d'une infrastructure et de structures d'imputabilité montrant un retour sur investissement. Une érudition de grande qualité en éducation*

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médicale nécessite un fondement solide et, au bout du compte, un bénéfice démontrable sur les soins aux patients.
Conclusion *L'obligation de rendre compte d'un apprentissage permanent dans le cadre de compétences établies semble inévitable. L'anesthésiologie est l'une des quelques rares spécialités qui peut vraiment protéger le corps professoral de responsabilités cliniques en faveur de la recherche de l'érudition. Avec un soutien approprié en faveur de l'érudition en éducation, les anesthésiologistes ont l'occasion de guider ces changements de paradigmes.*

Medical education today faces two major paradigm shifts. First, there is a major shift towards competency-based education that is changing the way we approach our learners, whether they are medical students, residents, or physicians attending a course for professional development. Second, there is a corresponding shift towards lifelong learning which emphasizes the need for physicians in practice to be comfortable with continuing education long after they pass their certification exams as well as with corresponding assessments of knowledge, skills, and attitudes throughout their careers.

These changes have brought about much concern and debate in the field along with numerous published articles that address various aspects of these issues but with relatively few solutions.

In this article, we examine the basis for these changes and explore ways that we as anesthesiologists can offer a thoughtful productive response that will ensure the continued strength of our system of medical education yet retain the flexibility to respond to new challenges. Specifically, this article examines the role of scholarship in medical education in mediating these paradigm shifts.

The shift towards competency-based education

In 1910, Abraham Flexner revolutionalized medical education with his report, *Medical Education in the United States and Canada: A Report to the Carnegie Foundation for the Advancement of Teaching*.[1] In his report, he called for large-scale reform of the existing medical education paradigm in North America. The two most widely adopted recommendations from his report included the movement of medical schools to universities and a shift to a curriculum emphasizing preclinical science followed by clinical training. A century later, there is an international call to challenge once again the existing medical education paradigm.[2]

Today, the discussion of competence seems to dominate every medical education forum. Agreement on a concrete contextual definition with respect to physicians has remained elusive. Attempts have been made to define competence in terms of knowledge, performance, reflection, reliable test scores, and resulting product.[3,4] In the absence of a unifying definition, Lingard has commented that the word competence is used as a "god term or rhetorical trump card, regularly played as the last word in debates about how health professions should function".[5]

Whatever criticisms might be levied at this movement, there is overwhelming evidence that it is here to stay. The 20th century model of medical education conferring competence is "time-based". Time-based medical education focuses on curriculum and experience obtained over a certain time interval. The time-based model has been compared metaphorically with "tea-steeping"; i.e., you place the trainee in the program for a fixed period of time and eventually the trainee develops competence.[6] Unfortunately, in the 21st century, there are mounting barriers and challenges to this model. Institutional pressures for increased efficiency in the delivery of care limit the opportunities for trainees to interact with clinician-educators and their patients.[7] In addition, the growth of medical knowledge and skills is exponential; therefore, the most obvious logical solution to deliver this knowledge is curricular expansion. For example, anesthesiologists have been challenged recently to expand the curricula to include a broader understanding of ultrasound as it pertains to both regional anesthesia and vascular access. Moreover, the exponential advances in surgical procedures and techniques often bring new considerations for anesthesia education. In conflict with curricular expansion and the resulting longer training period are societal needs to graduate doctors, maintain a fixed cost to train physicians, and an international call to reform work hours, i.e., to limit the number of hours in a given week that a trainee could devote to both work and education.[8] In fact, there is pressure on both the government and trainees to justify the current length of training, as it seems to be determined mostly on history and tradition rather than on empirical evidence. Interestingly, despite this loyalty to tradition, nearly all teachers and educators would agree that all learners acquire knowledge and skills at different rates.

Competency-based education (CBE) is "spreading like wildfire" as an alternative to the time-based model.[9] In a recent publication from an international collaborative, CBE has been defined as "an approach to preparing physicians for practice that is fundamentally oriented to graduate outcome abilities and is organized around competencies derived from an analysis of societal and patient needs. It de-emphasizes time-based training and promises greater accountability, flexibility, and learner-centredness."[10]

Challenges for competency-based education

As Philibert points out, the two obvious challenges to a competency-based approach are: 1) to define the outcome abilities for competencies and 2) to create valid and reliable assessment tools.[11] Until the 1980s, society expressed the main requirements of physicians in terms of medical knowledge and technical expertise. The 21st century has seen the demand for a more holistic physician who embodies a broader set of competencies to address both patients' needs and societal needs.[12] Multiple international approaches to competency have been defined (Table 1).[13–15] As specialty physicians in Canada, we are most familiar with the CanMEDs competency framework which defines competence over seven domains of equal importance but is recognized to centre around medical expert (Figure).[16] The current struggle with all existing frameworks is the overly broad description of the competencies. This shortcoming affects the ability to define discrete outcomes for a competency that would facilitate the development of valid assessment tools.[17] Nevertheless, in Canada, more specific and tangible definitions of the competencies are being developed along with assessment strategies for both the medical and non-medical expert competencies.

What are the implications for medical education resulting from such a change in focus? Will we shift paradigms from a time-based model to CBE built around these frameworks? Just as time-based models have their challenges, CBE would also face formidable barriers in addition to those concerned with defining outcomes and assessment tools. Variable rates of learning would necessitate an increased need for faculty to support this individualized learning and a requirement for faculty training in all facets of education, many of which are outlined in this theme issue. Faculty would need to be well-versed in giving feedback as formative assessment, which would be virtually continuous in a CBE model.[18,19] There would be a need for faculty development in simulation, which is presumed to play an important role in CBE for deliberate practice, accelerated "hands-on" learning, and formative assessment in a patient safe environment.[20] Individualized learning will assuredly mean shorter training times for some, but it could also mean longer training times for others; thus, the economic benefit for governments may be neutral. As well, individualized learning could alter the

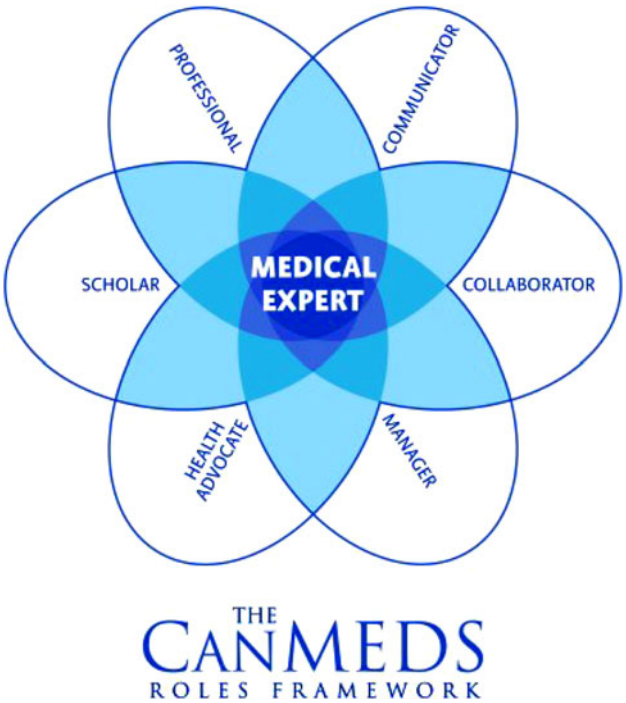

Figure CanMEDS competency framework. Available from URL: (http://rcpsc.medical.org/canmeds/index.php (accessed October 6, 2011). The CanMEDS Physician Competency Diagram reproduced with permission of the Royal College of Physicians and Surgeons of Canada. Copyright© 2009

Table 1 Contrasting competency frameworks: Canada, United States, and United Kingdom

CanMEDS (Canada)	Good Medical Practice (United Kingdom)	ABMS/ACGME (United States)
Medical Expert	Good Clinical Care	Patient Care and Procedural Skills
		Medical Knowledge
Communicator	Relationships with Patients	Interpersonal and Communication Skills
Collaborator	Working with Colleagues	Systems-based Practice
Manager	Maintain Good Medical Practice	
Health Advocate	-	
Scholar	Teaching and Training, Appraising and Assessing	Practice-based Learning and Improvement
Professional	Probity	Professionalism
	Health	

ACGME = Accreditation Council for Graduate Medical Education

ABMS = American Board of Medical Specialties

service-to-education ratio of clinical training. Service required for patient care in academic centres could become unpredictable if a trainee completes the competencies for a rotation and departs unexpectedly. Whitehead and Hodges are very clear that the profession should fully appreciate the magnitude and scope of the impact of this paradigm shift prior to implementation.[6,9] A paradigm shift is inevitable, but as with any paradigm shift, including that proposed by Flexner, implementation would most likely occur over decades. Based on past experience in education, implementation could likely be a hybrid of "old and new" with partial adoption of the new paradigm.[21]

The shift towards lifelong learning

The existing competency frameworks for physicians were created to address a need in undergraduate and postgraduate programs. However, discussions of competence have led to ongoing debates of maintenance of certification (MOC) programs for physicians since any MOC initiative for promoting lifelong learning would require ongoing assessments of knowledge and skills. From the perspective of a Canadian anesthesia residency training program, the gatekeeper to licensure in most provinces is successful completion of the program and passing a comprehensive summative examination comprised of a written and oral component administered by the Royal College of Physicians and Surgeons of Canada (RCPSC). A successful Canadian trainee is then conferred Fellowship in the RCPSC.[22] One of the professional ethics of all Fellows is the responsibility that each member remain current.[23,24] Most institutions require anesthesiologists to participate in a MOC program similar to that offered by the RCPSC, which is designed primarily to keep track of the number of hours a physician participates in continuing professional development. Prescribed minimums are required over a cycle of a set number of years. Occasionally and randomly, participating Fellows may be audited to authenticate their submission of hours. Other watchdog regulatory and licensing bodies, like the provincial colleges, lack the infrastructure and resources to monitor competence and promote excellence; as such, they are forced to protect the public by reprimanding reported incompetence.[25] Our current systems in Canada have been questioned and criticized for lacking robustness to ensure that Canadians are receiving best medical practices.[26] In response, measures have been implemented to increase the validity of the MOC programs. In addition to reporting the number of hours spent in continuing professional development, Fellows are now asked to report how the professional development activity will impact their practice.[27]

Challenges for lifelong learning

The inherent problem with the current system is that it nearly completely depends on the ability of physicians to self-reflect on their practice and decide how they will use new information to improve their practice.[28] Unfortunately, we know that physicians' ability to self-assess is poor when compared with any valid measure of competence, and this is regardless of specialty or length of time in practice.[29] Unidirectional didactic lectures, which exemplify passive group learning, are the most common continuing professional activity. Systematic reviews have confirmed that these learning activities have an almost negligible effect on altering clinical practice.[30]

Both the government and the public have called on our self-regulated profession to increase their accountability in ensuring that physicians maintain their competence. This concern is not unique to Canada. In the United Kingdom, the call for increased accountability has led to the loss of self-regulation and increased oversight by regulators and employers. In the United States, cognitive written examinations for recertification are required by the American Board of Medical Specialties which oversees all specialty certification boards, including the American Board of Anesthesiology.[31] Recertification examinations are supported overwhelmingly by the public who have mistakenly believed that the exams are already well established across North America.[32] Some have argued controversially that recertification examinations have not come to Canada due to physicians' apprehension, the challenge of creating a valid examination specific to one's practice as it becomes sub-specialized, and the potential of losing physicians in the workforce in an already underserviced population.[26] While the metrics of defining competence need to be meaningful and transparent, not surprisingly, most regulators agree that they also need to be accepted by physicians as well as the public.

Implications for assessment of competence

Opponents to recertification exams embrace the international move to CBE. The CBE experts promote the concept of "progression of competence," meaning that learners advance along a series of defined milestones on their way to the explicit outcome goals of training. These definitions necessitate that competence must be conditional on, and constrained by, each physician's practice context, and this required context should be dynamic and continually changing over time.[33]

If we accept the concept of progression of competence, then we also need to consider deconstructing the traditional silos of undergraduate, postgraduate, and continuing medical education and adopt a philosophy of lifelong learning. A movement to CBE and lifelong learning may also have a

secondary gain of de-emphasizing the reliance on static third-party (i.e., Medical Council of Canada, Royal College of Physicians Surgeons Canada) high-stakes summative examinations that usually focus solely on medical expert competencies.[34] Instead, medical schools and residency programs would be empowered to make multiple competency-based assessments during a training period. This would necessitate operationalizing a breadth of assessment modalities that would capture both medical expert and non-medical expert competencies.[35] Assessment modalities could include multisource 360° feedback surveys, peer review or patient surveys; and skills and practice evaluated through a range of clinical data, including clinical audit, clinical outcomes, mortality and morbidity, complaints, incidents, procedural logbooks, or structured case reviews.[29] With multiple serial assessments from multiple sources, programs would compile more data to make an informed decision to declare competency, and trainees would be less pressured to perform for a single examination.

This shift in assessment may also begin to change the current resistance to MOC noted earlier. With exposure to different assessment modalities in training, physicians in practice may be more willing to engage in self-reflection activities and self-directed assessment activities that are viewed as formative and not punitive.[36] There is mounting evidence that active learning through formative assessment and feedback has a greater impact on translation to practice.[37] In 2011, the RCPSC promoted self-directed assessment as a valued MOC activity by incentivizing their value compared with other professional development activities.[38] However, without shifting the culture of assessment by leveraging CBE, we suspect that incentivizing self-directed assessment activities will have a minimal impact. If uptake does not increase, discussion will likely amount to mandated activities which provide the clinician with direct feedback. If we are unwilling, as a profession, to embrace lifelong learning proactively with regular formative feedback, then we may be forced to accept "high stakes" recertification examinations and a potential dismantling of true self-regulation.

The need for scholarship in medical education

The two future paradigm shifts described above are likely inevitable. As a profession, we must adopt a scholarly approach in order to mediate the benefits and the challenges of these changes successfully and in an evidence-informed manner. As specialist physicians, the CanMEDS framework identifies scholar as one of our core competencies. As anesthesiologists, we have an opportunity to lead the field by engaging in this scholarship.

Traditionally, research has been equated with scholarship, while teaching has been seen as a baseline activity that "everyone does", with the assumption that expertise in clinical practice is a sufficient prerequisite for expertise in teaching.[39] Boyer's seminal 1990 publication broadened this narrow definition by re-conceptualizing scholarship as consisting of four components: discovery, integration, application, and teaching.[39–41] The academic anesthesiologist can relate to any or all of these four components. The scholarship of discovery is the discovery and creation of new knowledge, traditionally associated with research. The scholarship of integration involves making connections of knowledge across and between disciplines, placing knowledge in a larger and richer context. The scholarship of application is the use of knowledge to solve problems and answer questions, i.e., knowledge translation. According to Boyer, the scholarship of teaching involves the communication of knowledge as well as the transformation and advancement of knowledge.[40] By identifying teaching as a scholarly activity, Boyer stressed that teaching must be valued as a specific skill and must be regarded as seriously as research for the academic mission of universities. However, Boyer did not specify the relationships between teaching, excellent teaching, scholarly teaching, and the scholarship of teaching.

Subsequent refinement of the definition of the scholarship of teaching has been offered by various authors.[41–44] Fincher *et al.*[41] defines teaching as the "design and implementation of activities to promote learning", which includes the actual act of teaching as well as curriculum and instructional development and assessment. Ideally, the product of teaching is student learning, and by extension, excellent teaching can be considered that which engages learners, communicates information effectively, and maximizes learning.[39,41,42] Scholarly teaching goes beyond excellent teaching by critically assessing the relevant educational literature for the most appropriate educational intervention, applying the intervention, observing and analyzing the outcomes, obtaining peer review, and using the results to improve or modify teaching.[41,42] For teaching to be categorized as scholarship of teaching, three additional criteria must be satisfied: it must be in a tangible form that is publically disseminated, it must be open to review and critique, and it must allow for others to use or build on to advance the field.[43,44]

Best evidence medical education (BEME) has been described as "synergistic" with the scholarship of teaching.[45] Coined as a term in 1998 and established at the Best Evidence Medical Education Collaboration in 1999, the mission of BEME is to disseminate the latest findings from "scientifically grounded educational research" in order to allow educators to make educational decisions based on the best evidence available, to provide systematic reviews of

medical education, and to enable a "culture of best evidence medical education".[46] The BEME approach means that teachers "question their practice, look for the best evidence available, relate the evidence to their own situation and apply their professional judgment" in implementing educational interventions or practices.[47] Evidenced-based medicine and BEME are not exactly analogous in that medical educational research draws from a wide methodological base apart from randomized controlled studies where quality and rigour is still being developed and defined.[48] Importantly, proponents of BEME stress that it serves as only one source of information, and ultimately, educators also need to draw from their professional experience and their understanding of their particular context to make appropriate decisions.[49]

The importance of scholarship in teaching has received increased attention and refinement in medical education over the years. A key initiative has been the recent work of the Association of American Medical Colleges' Group on Educational Affairs (AAMC-GEA), which began in 1996 by defining the criteria for scholarship in medical education and culminated in a consensus statement on educational scholarship and its documentation.[39] Although often used interchangeably with the scholarship of teaching, "educational scholarship", as defined by the AAMC-GEA, is a more inclusive term that reflects the spectrum of education activities, including teaching, curriculum development, advising and mentoring, educational leadership, and administration and learner assessment.[39]

Strategies for enhancing educational scholarship locally and nationally

How can educational scholarship be promoted? Drawing from the literature, four broad strategies aimed at the local, departmental, and institutional levels are proposed.[39,44,50]

(A) Promotion of excellent teaching and scholarly teaching

The promotion of excellent and scholarly teaching starts with the premise that teaching skills are not innate but need to be fostered, developed, and taught in the same manner that clinical skills are taught. Therefore, the following experiences should be made available: academic rounds, orientation sessions for new faculty, professional development workshops, access to educational resources, and mentorship programs to promote the concepts of excellent teaching and scholarly teaching.[50]

Excellent teaching engages and motivates; it stimulates critical reflection, synthesis, and application and furthers knowledge in learners. A scholarly approach to teaching and learning draws from broad educational principles; it is theory and evidence-informed and critically reflective of its assumptions and contexts in order to choose the most appropriate educational strategies. These strategies are then applied and monitored for their effects and outcomes. Afterwards, a peer review is carried out, and the strategies are modified accordingly. The findings are communicated in order to improve the educational practices of the organization or institution.

(B) Promote broad recognition that teaching is a valued and scholarly activity

Valuing and recognizing teaching as a scholarly activity should be made apparent by promoting leadership positions in education, educator representation on major committees and educational activities, infrastructure support, financial remuneration, merit awards, protected time for educational activities, research funding, as well as support for faculty development, continuing education, and advanced training in education. Since most anesthesiology practices do not manage a roster of patients or a clinic, they are well positioned to protect non-clinical time for scholarly pursuits.

(C) Promote a strong institutional culture to support educational scholarship

Universities, departments, and faculties should be informed about educational scholarship and the criteria for its assessment. They should develop or adopt an official educational scholarship framework such as proposed by the AAMC.[39] Educational scholarship, including educational research, should be valued on equal terms with clinical and basic science research, and it should be reflected in the criteria for promotion and tenure, funding, and awards. Educators should be involved in major leadership positions with the resources and infrastructure for the development of networks of educational academies and communities of practice both within and outside of the institution. There should be a well-developed and integrated program for faculty development. Support should be shown both symbolically and operationally. Additionally, to support the promotion of clinician educators who engage in scholarly teaching, there should be a place reserved on promotions and tenure committees for educational scholars or those with knowledge in the field.

(D) Foster educational scholarship in residents and other trainees

As residents and other trainees represent the future generation, it is critical to educate and role model this expanded vision of anesthesia education. Residents and trainees should be mentored and given opportunities to participate

in teaching, curriculum development, assessment, and educational research.

On a national level, what are strategies and resources available for educators to enhance educational scholarship? Eleven of the 17 medical schools in Canada have medical education research units with a mission to promote innovation and scholarship in medical education. These units are typically populated with full- or part-time PhD educators and a core group of part-time clinician educators with a commitment to develop scholarship in medical education. Most of these units provide some type of support for the larger number of clinician educators at those institutions, e.g., education rounds, grant programs, and support for fellowships and graduate degrees in education. Much of the activity of the PhD educators involves direct collaboration and mentoring of MD educators, who are starting out in the field, with individual consultation and education scholars' programs to supplement the pursuit of graduate degrees in education. Many of these units also have an annual Education Research Day to highlight progress on projects and innovations and to encourage further scholarly work. Finally, it would be most helpful for clinician educators embarking on this journey to have a "core facility" of project assistants to support management of educational research projects (i.e., to provide support for focus groups, transcription services, qualitative and quantitative methods, and ethics applications for medical education research).

Although many such units exist, there is still tension within each institution as discussions continue around the allocation of scarce resources. Some of the issues surrounding the successful establishment and management of such units include the status of the unit within the Faculty of Medicine, specifically as a department or an extra-departmental unit. In both models, success depends on the degree of support from the clinical departments, both in principle and financially.

Some of the successes that can be achieved include the ability to explore cutting-edge innovations (i.e., e-learning, team-based learning, simulation) and test them with a scholarly approach. In addition to innovations in teaching, there are also many areas that require further research and development, including the field of learner assessment, the use of portfolios, and 360° assessments, in order to address the move towards competency-based education alluded to above. Appendix provides a list of possible future topics for educational scholarship.

In terms of outlets for scholarship and innovation, there are now many journals that publish medical education research exclusively, as well as sections in clinical journals that offer space for medical education research. In addition, technology has enabled several online outlets for disseminating ideas and works in progress in a peer-reviewed forum, e.g., Med Ed Portal (https://www.mededportal.org/).

An accountability framework for scholarship in medical education

One approach to ensure increased visibility for the value of medical education scholarship is to promote a transparent dissemination of accountability metrics. But what are the metrics? The metrics normally used in academic health centres regarding publications and securing grants do not necessarily apply well to medical education, especially since medical education research is not as well-funded as the traditional medical disciplines. Also, dissemination through publication may not always be the most appropriate method of knowledge translation for this discipline. One idea to improve visibility is to make use of other metrics, such as impact statements or other types of data based on qualitative research. Regardless of the medium, there is great concern and discussion within the field of medical education regarding quality and standards of reporting.[51]

When used in combination with standard educational principles and practices, the Kirkpatrick hierarchy mentioned earlier in this theme issue can be a powerful approach for enhancing the accountability of educational scholarship and evaluating the impact of educational innovations.[52] An example may help to illustrate the potential effectiveness of this scheme. When a proposal based on intuition and experience is made to change a portion of the curriculum, it is in our best interest, in terms of both our learners and collectively as a field, to ensure that we evaluate the impact of such changes in a scholarly manner. But how do we know the type and degree of modification that warrants further support and adoption locally and perhaps nationally? A general approach is to ask the following four questions: 1) Is there a rationale or needs assessment for guiding how the proposed intervention addresses gaps in the current curriculum? 2) Are there well-defined learning objectives to help the teacher focus on essential constructs to be taught? 3) Is there a detailed lesson plan to ensure the identified needs are met? And, most importantly, in terms of scholarship: 4) Is there a plan for evaluating the impact of the educational intervention? This last question can be addressed directly by making use of the Kirkpatrick hierarchy described above. For example, at the most basic level, "reaction", we would want to know how many learners participated, both in terms of absolute numbers and relative to the population of learners available in that context. Moving to level 2, "learning", we would ask if the educators had evidence for a change in learners' attitudes or knowledge or skills as a direct result of the intervention. Take notice that such a question is strengthened if proper controls are present in the design of the intervention, such as a comparison group and/or random allocation to groups. At level 3, "behaviour", the educator should provide evidence for a change in behaviour, typically information that is much more

difficult to obtain as it suggests a follow-up in data collection to determine if there has been a change in learner behaviour in the applied setting. At the highest level, "results", participants are assessed based on the extent that the targeted outcomes are a result of the training event and the subsequent training reinforcement. The outcome might consist of changes in practice or patient outcomes. The higher levels are particularly relevant for the comprehensive assessment of a physician or the evaluation of a curriculum to deliver both the medical expert and non-medical expert CanMEDS competencies. This modified hierarchy seems to have gained significant traction in medical education; scholars using the hierarchy are offered the advantage of raising the threshold on the type of evidence they accumulate to support their innovations. Boet and Reeves[19] have described modifications and additions to this hierarchical framework to account for subtleties and issues most relevant to medical education. The management and monitoring of innovations in this manner along with the collection of relevant data foster an accountability that ensures a thoughtful and rigorous approach to the implementation and accountability of educational interventions and prepares the way for reporting to stakeholders, e.g., accreditation agencies.

Finally, there is a need to establish common practices for educational leadership positions in medical education, including planning for succession. For example, residency program directors might benefit from having assistant program directors to help develop scholarly projects and innovations around local residency training issues. Similar models could be established for clerkship directors and CME directors. Certainly, the current model with its competing demands on administration and clinical work does not afford much time for program directors to engage in such scholarship on their own. Working in concert with an established local network of dedicated PhDs and clinician educators could greatly increase scholarly productivity in medical education with a relatively modest investment. Obviously, many of these issues have to do with plans for funding within clinical departments, which speaks again to the culture of educational scholarship within each institution.

Conclusion

In conclusion, we have outlined an approach to address two major movements in medical education, competency-based education and lifelong learning. No doubt, the shift towards competency-based education, which ties in closely with the drive towards lifelong learning, will have reverberations in anesthesia education for years to come. Both forces demand a renewed individual accountability as both trainees and physicians in practice will be required to demonstrate competence according to external mandates. Whether we as anesthesiologists have complete control over those mandates and the required standards remains an open question. It appears we now have an opportunity to develop evidence to support specific recommendations to assess competence. This response requires a scholarly approach, as we must be scrupulous in the way we define and assess specific aspects of competence. By adopting a new model of educational scholarship, we can develop local infrastructure that will support the acquisition of best evidence to define and assess competence in our field. Although part of this effort requires a shift in the culture surrounding medical education both locally and nationally, there are specific structural and strategic measures which can be undertaken to foster that change. The support of educational scholars' programs and fellowships in medical education can contribute meaningfully to address these challenges.

Accountability and advocacy must remain the watch words for our field. Many opportunities exist to prove the value of our vocation as medical educators and to support the further development of medical educators and medical education programs. By embracing educational scholarship, anesthesia educators will be better able to navigate the exciting challenges and opportunities posed by these two major movements in medical education.

Key points

- Medical education is on the verge of a paradigm shift from time-based to competency-based education and a consequential need to embrace a culture of lifelong learning.
- Scholarly teaching goes beyond excellent teaching by using best evidence in medical education to improve or modify the teaching. Scholarship of teaching disseminates teaching innovations publicly for review and critique by peers and for eventual adoption.
- Promoting scholarship of teaching requires faculty and the institution to support the view that teaching is important and valued. Faculty development has an important role in understanding that teaching skills are not innate, and best education practices need to be grounded in scientific education research.
- Medical education research units that engage PhDs can support education scholarship by collaborating and mentoring clinician educators. Program offerings can include education rounds, grant programs, fellowships in medical education, support for graduate degrees, and collaboration on peer-reviewed grants and publications.
- Accountability frameworks should be developed for scholarship in medical education. These frameworks can help guide the quality of the rationale for education interventions as well as the impact of teaching innovations.

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Appendix

Future directions for scholarship in medical education

1. **CONTEXTUAL ISSUES**
   - The History of Medical Education
   - Philosophical Foundations in Medicine and Medical Education
   - The Influence of Medical Practice on Medical Education
     - Medical Administration and its Impact on Medical Education
     - The Intersection of Medical Education and Health Services Research
     - The Underused Potential of Morbidity and Mortality Rounds on Medical Education
   - Academic "Silos" in Healthcare Centres and Their Impact on Medical Education
   - The Influence of Social Sciences and Substantive Academic Disciplines on Medical Education
   - Socio-cultural Issues in Clinical Teaching
     - Psychosocial Aspects of Medicine and the Doctor-Patient Relationship
   - The Effect of Technological Developments on Medical Education
     - Preparing the Lifelong Learner
   - Medical Sociology – Bioethics and Medical Education
     - Teaching and Assessment of Humanism and Professionalism

2. **COGNITION AND EDUCATIONAL THEORY**
   - Principles of Adult Learning
   - The Nature and Nurture of Medical Expertise
   - Transfer of Learning
   - Clinical Reasoning and Medical Decision-making
   - Motivation and Deliberate Learning
   - Individual Learning Styles

3. **EDUCATIONAL ASSESSMENT**
   - Selection of Medical Students and Residents
     - Non-cognitive Criteria
   - Assumptions about Individual Competency Assessment
   - Methods and Approaches
     - Multiple Choice Questions
     - Portfolios and Multi-source Feedback
     - Formative and Summative Assessment
     - High-stakes Assessment
     - Performance-based Assessment
     - The Use of Simulated Patients in Performance Assessment
     - Workplace-based Assessment
   - Best Practices in Item Writing
   - The Simulator as an Assessment Device
   - Assessment of Non-cognitive Skills
     - Assessment of Teamwork and Communication Skills
   - Evaluating Effective Teaching (Teacher Effectiveness Ratings)

4. **TEACHING AND LEARNING**
   - Enhancing Effective Teaching in a Clinical Setting
   - Communication Skills
     - Breaking Bad News
   - Designing a Curriculum for Continuity of Care Training
   - Community-oriented Medical Education
   - Residents as Teachers
   - The Hidden Curriculum
   - Simulation in Medical Education
     - Effectiveness of Simulators as Training Platforms
     - High-stakes Assessment
     - Remediation
     - Trainee Buy-in, Motivation
     - Cost-effectiveness
     - Integration with Standardized Patients
     - Where to Situate Simulators Within Curricula
     - Recertification
     - Resident Selection

5. **CURRICULUM DEVELOPMENT AND EVALUATION**
   - Approaches to Curriculum Development and Design
   - Curriculum Mapping

- Methods for Alignment Across Courses and Programs
- Curriculum Evaluation as Program Evaluation

6. LEADERSHIP/CAREER DEVELOPMENT

- Organizational Change
- The Importance of Educational Scholarship in the Medical School
- Capitalizing on Educational Leadership Opportunities
  - Promotion Criteria for Clinician-educators
- Effective Mentorship
- Personal and Professional Growth
  - Factors Influencing Job Turnover in Educational Administrative Roles
- Socialization into the Profession and Professional Identity Formation
- Communication Skills

7. METHODOLOGY AND RESEARCH PRINCIPLES

- Quality of Research in Medical Education and Related Fields
- Best Evidence in Medical Education
- The Influence of Social and Political Factors on Funding in Medical Education Research
- Best Practices for Mixed Methods Research

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