

PERSPECTIVE

Health professions education scholarship: The emergence, current status, and future of a discipline in its own right

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Abstract

Medical education, as a domain of scholarly pursuit, has enjoyed a remarkably rapid development in the past 70 years and is now more commonly known as health professions education (HPE) scholarship. Evidenced by a solid increase of publications, numbers of specialized journals, professional associations, national and international conferences, academies for medical educators, masters and doctoral courses, and the establishment of many units of HPE scholarship, the domain of HPE education scholarship has matured into a scholarly discipline in its own right. In this contribution, the author reviews the developments of the field from Boyer's four criteria that determine scholarship: discovery, integration, application, and teaching. Born mid-20th century, and in the first decades developed in the predominant area of physician education, HPE scholarship has matured, with increasing breadth, depth, and volume of scholars, publications, conferences, and dedicated centers for research and development. The author concludes that, given the infrastructure that has emerged, HPE can arguably be considered a discipline in its own right. This academic question may not matter hugely for practices of scholarly work in this domain, and any stance in this academic debate inevitably reflects a personal view, but the author would support the view of health professions scholarship as being a unique niche, with inherent dependence on both medical and other health professional sciences, on the one hand, and social sciences, including educational sciences, on the other hand.

KEYWORDS

conferences, health professions education, History, medical education, publications, scholarship

1 | THE HISTORICAL OUVERTURE OF SCHOLARSHIP IN MEDICAL EDUCATION

The education of medical students to become doctors, general practitioners or medical specialists, is a long route, requires

hard work and involves abundant knowledge acquisition. That phrase may characterize in a nutshell how many people would summarize all they know about medical education, unless they have personal involvement. Most educational scientists, as well as most biomedical scientist, involved in educational or medical scholarship, may not realize the richness

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of the intersecting field of medical education scholarship, currently subsumed under the broader term of “health professions education.”

This article was independently solicited for special issues of *Beiträge zur Hochschulforschung* and *FASEB BioAdvances*, with quite different audiences, both of which are, we estimate, not deeply informed about medical education.

The purpose of this contribution is to inform educational scientists and biomedical scientists about the intersecting domain of health professions education, elucidating its history and current status as a rapidly emerging scholarly domain.

The intersection of two fundamental pillars of a thriving society—population health and population education—is the art of educating doctors and other health professionals to serve the health of populations. Medical education has always enjoyed the dedicated interest of physicians and educators. Mythology teaches us that the first renown medical student and educator, Asclepius, son of Apollo and Coronis, had been educated himself in the art of medicine by centaur Chiron, and had learned about healing and resurrection from a snake who became his company along with a magical rod (Figure 1). Rod and snake became and remained the most important symbols of medicine throughout the ages until today, as witnessed by the many logos of medical associations around the world. It should be acknowledged that Chiron and Asclepius were not only famous for their medical knowledge, but also known for their educational skill.

In the 21st century, medical and biomedical sciences have become a major industry through specialized hospitals, laboratories, universities, and commercial enterprises. Education, while for many ages focused on primary schooling and handcraft for the youth, has developed in the past century in industrialized societies with secondary education for most and

tertiary education for many citizens with important scientific foundations. The science of education has developed strongly in the 20th century.

Medical education itself has been a respected art through the ages. Famous medical scholars and educators through the ages include Hippocrates, Celsus, Galen, Andreas Vesalius, Herman Boerhaave, William Osler, and William Halsted as prime examples until the early 20th century.^{1–4} Many more medical educators followed, nationally or internationally famous, and most medical schools take pride in some of their own professors of the past, honoring their names and faces in portrait galleries and lecture halls.

For many ages, the anatomy of the human body through dissection was central to preclinical education. Figure 2 shows professor Nicolaes Tulp (1593–1674), delivering a public dissection lecture at the Waag Anatomical Theater in Amsterdam.

2 | THE BIRTH OF MEDICAL EDUCATION AS A DOMAIN OF SCHOLARLY STUDY

While the art of teaching medicine became widely acknowledged over the centuries, the study of medical education, with its focus on methods and effectiveness of medical education, independent of individual educators, became a focused domain of study only recently. Its emergence can be considered to have started primarily from mid-20th century, linked to development of new approaches to the medical curriculum, with new methods, objectives, and content. With the rapid increase of medical schools around the world, from 566 in the year 1953 to 2881 in the year 2018⁵ the interest in scholarship

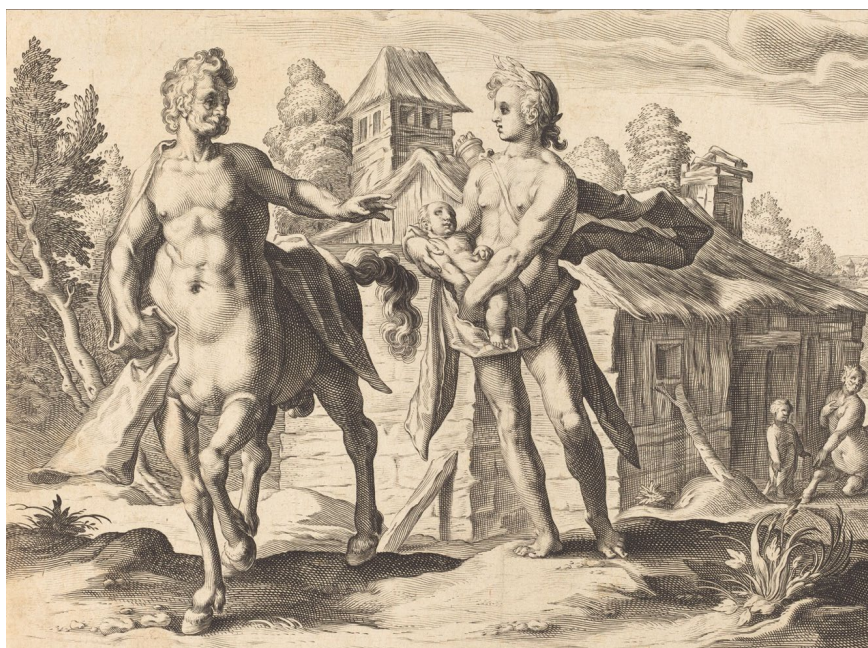


FIGURE 1 Hendrick Goltzius (1558–1617) *Apollo, about to entrust centaur Chiron with the education of Asclepius* [Courtesy National Gallery of Art, Washington DC]



FIGURE 2 Rembrandt van Rijn, *The Anatomy Lesson of Dr. Nicolaes Tulp*, 1632 [Courtesy Mauritshuis, The Hague, the Netherlands]

of medical and, later, health professional education has developed remarkably.

It is difficult to pinpoint an undisputed moment in time that can be qualified as the starting point of medical education scholarship as a discipline. Usually many factors together, operating coincidentally, enable such an emergence. Medical education historian Ludmerer rightly qualifies the years around 1920 as the start of modern medical education in the United States,⁶ shortly after Flexner's famous but critical 1910 Carnegie Report that forced U.S. schools to either close or modernize⁷—while less influential in Europe.⁸ The first issue of the *Journal of Medical Education* appeared in 1920, but, frankly, the start of medical education development and research as a scholarly endeavor may be better located around 1950, the year that Western Reserve University established a committee to modernize their medical curriculum, followed by the University of Colorado a few years later, two endeavors that were extensively documented,^{9,10} and therefore, enabling to pinpoint the start of a movement. With George Miller, Stephen Abrahamson, Hilliard Jason, Christine McGuire, and Howard Barrows at universities in New York, Michigan, Illinois, and California, prominent examples of a first generation of medical education scholars emerged, together constituting a new discipline about 70 years ago, when the first distinct units of education research were established in medical schools.^{11,12} In parallel, in the 1950s, medical education became an external object of study by social scientists, who produced influential psychological and sociological reports after studying what it means to become a doctor.¹³⁻¹⁵ Not only the United States established units for the study of medical education. McMaster University in Canada, University of Dundee in Scotland, and Maastricht University in the Netherlands are among the first

institutions with units for scholarship in medical education in other countries.

A few individuals, teachers, researchers, or even centers with a specific interest in a particular domain of scientific pursuit may not yet make the field a recognizable scholarly domain. So the question is: what would be needed to call someone a medical or health professions education (HPE) scholar^a and to call a community of such individuals *scholarly*? Ajjawi and colleagues found that an environment fostering researcher identity formation, collaborative relationships, and protected time for research is likely to make health professions education scholarship thrive.¹⁶ To create that identity, the scholar should belong to a community with specific characteristics. Scholarly communities may be defined using Ernest Boyer's widely cited four criteria that, together, should determine scholarship: discovery, integration, application, and teaching.¹⁷

Discovery is the production of new ideas and insights, things that are worth knowing, if only to satisfy scientific curiosity. A significant number of scholars should engage in active HPE research and yield research findings that advance the domain, to give this criterion weight.

Integration is giving meaning to isolated facts and connecting new findings with what is already known, within and across disciplines. Coherence must be established, by relating to or involving social and other sciences and by various research synthesis efforts, if only to avoid wheels being reinvented. A body of accepted knowledge is to be built through integration.

Application relates to the usefulness of findings to solve problems. Scholarship must "prove its worth not on its own terms but by service [to society]" (Boyer, page 23). It should be visible through improved medical and health professions

education curricula in practice, through improved competence of graduates and, ultimately, through better health care.

Teaching, as "the highest form of understanding" (Boyer, page 23), involves scientific communications and the education of future scholars. While Boyer had students and individual interactions in mind, teaching can also be done through conferences, publication of books, papers, and modern media. Teaching in its broader sense, would be characterized by the sufficient and sustained training of next generation scholars and sufficient publications, conferences, associations that would characterize the existence of a true interactive scholarly community.

Glassick¹⁸ and O'Brien et al¹⁹ have elaborated Boyer's criteria not only for individual scholars in health professions education scholarship units. The criteria may also apply to the scholarly HPE community at large. In this contribution, I will use these criteria to examine the domain of health professions education scholarship in general.

3 | DOES HEALTH PROFESSIONS EDUCATION QUALIFY AS A SCHOLARLY DOMAIN OR DISCIPLINE?

Academic disciplines and subdisciplines are not unequivocally defined. They are usually acknowledged by universities and categorized in faculties, departments, and academic courses, sometimes by scientific societies and sometimes by law, when licensing and privileging is restricted. But beyond formal, institutional statements, it is the dynamics among scholarly individuals, with their interactions and activities, that determines what a scholarly community or discipline is. Social Identity Theory posits that for individuals it is important to belong to a group that provides them with identity.²⁰ Social identification supports self-esteem and group behavior,²¹ as people like to know and take pride in what they are, be able to explain that to others, use it for purposes as seemingly futile as business cards and stationary, and also to connect with likeminded

others. A defined identity in a scholarly community can also affect promotions in an organization, and even funding of research. Defining a discipline is not trivial.

Thus, organized by Boyer's criteria, how might we value medical education or, more broadly, health professions education, as a scholarly field or discipline? My contention is that it has become a mature scholarly domain, and maybe even a discipline in its own right. Let us review Boyer's criteria.

3.1 | Discovery

To meet the *Discovery* criterion, there must be sufficient researchers who are active discoverers. We do not know how many HPE researchers exactly are active worldwide, in 2021. However, there are some proxy indicators of growth in volume since 1950. If an active researcher would be someone who publishes at least one journal article per year over a sustained period of time, say 10 years, and discovery would be defined as the addition of a fact or insight to the body of knowledge of health professions education, it is worth looking at number of published papers and their authors at different moments in time.

In 1980, there were three dedicated medical education journals: the *Journal of Medical Education* (now called *Academic Medicine*), *The British Journal of Medical Education* (now called *Medical Education*), and *Medical Teacher*. The oldest one (the *Journal of Medical Education*) featured about 450 authors across the year of 1980 (12 issues), including non-researchers, but also some authors who published more than once. In 2020, the estimated number of authors contributing to the 12 issues of this same journal has about tripled. A different proxy of growth is shown in Figure 3, comparable to graphs presented by Jason in 2018.²² The combined words "medical" and "education" in journal article titles shows a 10-fold increase in less than 50 year (data from Google Scholar; and note that such titles only cover a small minority of articles in the domain). In addition, in those 40 years the number of international peer reviewed medical education journals has steadily grown from three to about 35, excluding dedicated education journals

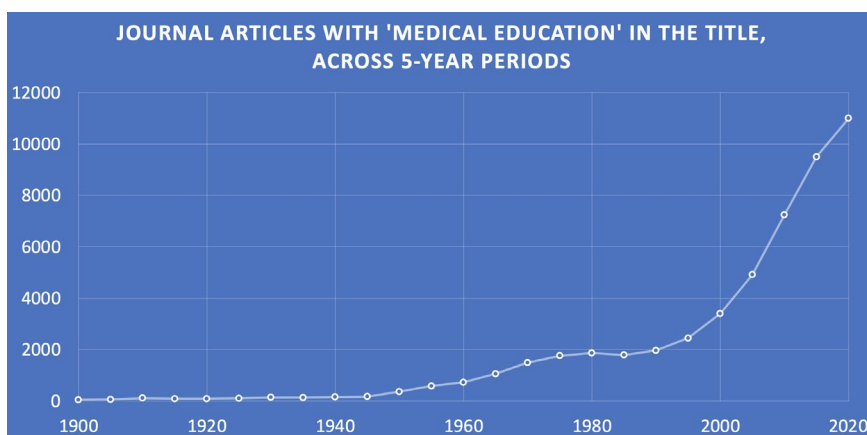


FIGURE 3 Increase of "medical education" as words in journal article titles [Google Scholar]

in specialty areas such as anatomy, physiology, biochemistry, surgery, simulation, and journals of national associations for medical education in many countries, not counting education journals in other health professions than medicine. The total list of journals predominantly publishing on health professional education approaches about ninety^b. If these each would feature only 100 authors per year and every scholar would produce one scholarly paper per year (both are very conservative estimates), the domain would have close to 100,000 authors. Rotgans estimated in 2010 that 10,000 articles had appeared in the six most common medical education journals in the past 12 years.²³ Taking an average number of three authors per paper and multiplying by three for the increased number of current quality journals leads to a similar figure. The quality of the numerous medical education journal articles may not all meet scholarly standards,²⁴ but if only 20% would be regarded as truly scholarly, the combined authors would establish a community of at least 20,000 true health professions education scholars, educators actively involved in research and development, which again is probably a conservative estimate. The critical mass for a scholarly community as criterion seems, arguably, amply met.

Next, generally acknowledged advances in the domain should support discovery. If medical education would not be "better" than 70 years ago, then, the Boyer's discovery criterion would probably not be met. So the question is, can we confirm this improvement? This criterion is much more difficult to measure or estimate. There is simply no measurement instrument to establish whether the 2020 medical graduates are better equipped for clinical practice than in 1950.

Advances and discoveries in educational research often focus on new theories and research methods, rather than evidence-based education advances, that stepwise and undeniably show better and better education outcomes. New, undisputed facts on which theories and practice can build, such as in physics, chemistry, and medicine, are rare in educational research.^{25,26} Sawyer contends that "the history of scientific approaches to [general] education is not promising" and cites the ongoing debate about whether education is a science or an art.²⁷ Others, however, have established evidence-based principles of learning and instruction.²⁸⁻³⁰ Different from biomedical or engineering advances that may be expected to "work" every time new procedures or therapies are applied appropriately, the effects of educational principles are less predictable. Not only do many variables, often not controllable, interfere with outcomes of education, the "system of education" itself is complex and adaptive. Complex adaptive systems react in their own way when variables change. A new, "proven" teaching method will, when applied, evoke emotions, motivations, and intelligent responses by students. Students, highly motivated to become doctors, will simply do whatever they feel is needed to reach their target, no matter which curricular methods and demands apply. They are not a black box, or a passive object that can be manipulated,

but have a free will to shape their learning pathway to some extent.^{31,32} For instance, excellent lectures may decrease the students' inclination to self-directed study, to the point that on tests they may perform worse than students who did not attend these superb teacher performances, and who may have felt forced to figure out the complexities of the content matter themselves.³³ What further complicates educational research is that outcome measures of educational interventions are difficult to determine. While knowledge and skills demonstrated at exams may be considered such outcomes, the true purpose of education, such as in medicine, is effective performance in practice and improved clinical outcomes, which are often determined by biomedical and technical advances, context and teamwork, not only by superior individual skills.^{34,35}

Despite these difficulties, however, current scholars in HPE would likely agree that many advances have certainly been made and turned into established educational practices in the health care domain. "Discoveries" in medical education are more often new educational or assessment methods, rather than findings supporting generalized theoretical truths. While undisputable evidence of educational innovations with guaranteed success is hard to establish,³⁶ several changes in medical education, based on credible theory, have had profound influence on medical curricula in the past 50 years and would now be viewed as recommended approaches. Rather than suggesting to be unequivocally evidence based, rigorous *best-evidence* medical education (BEME) literature reviews have been popular resources for medical educators.³⁷ Over 60 BEME reviews have been published in the past 20 years, in addition to many other knowledge syntheses in health professions education.

Table 1 shows examples across a 50-year period of findings and educational advances in medicine, "discoveries" if you will, that can be attributed to scholars in the field of health professions education. A limitation of the table is that does not do justice to the important scholarly work of many medical educators not associated with single identifiable concepts, findings, or innovations. Applying advanced skills training and advanced assessment techniques, deliberate practice, mastery learning, clinical reasoning tests, instruments to measure clinical learning environments, physical space for education, studies to correlate lapses in professional behavior with later adverse practice events, studies on theories of workplace learning, motivation, cognitive load in medical education, conditions for interprofessional education, studies on burn-out and depression, and many other findings or innovations that were tried on smaller scale all have improved medical training to some extent. Still other scholars, rather than presenting or trying an innovation, have helped sharpen the mind by debunking myths about medical education,³⁸⁻⁴¹ or provided major overviews of strengths and weaknesses in medical education, and urged for reform.^{42,43}

Medical education, and to some extent other health professions education, as we know it today would be definitely different without these advances.

TABLE 1 Examples of influential innovations and advances in medical education across 50 years of scholarly work

| Innovations, concepts, and findings | Scholars associated with this innovation | Year of origin / publications |
|---|---|-------------------------------|
| Simulated and standardized patients | Howard Barrows, Stephen Abrahamson | 1964 79 |
| Objective Structured Clinical Examination | Ronald Harden | 1975 80 |
| Problem-based learning | Howard Barrows, Henk Schmidt | 1975 81-83 |
| Content or case specificity of clinical expertise | Arthur Elstein, Geoff Norman | 1978 84,85 |
| Progress testing | Cees van der Vleuten | 1982 86 |
| Key-feature items to assess clinical competence | Geoff Norman, Georges Bordage, Gordon Page | 1984 46,87 |
| Faculty development in medicine | Kelley Skeff, Yvonne Steinert | 1984 88,89 |
| Clinical teacher knowledge and reasoning | David Irby | 1991 90 |
| Longitudinal Integrated Clerkships | Lori Hanson, David Hirsh, Ann Poncelet | 1992 91,92 |
| Hidden curriculum | Frederic Hafferty | 1994 93 |
| Mini-Clinical Evaluation Exercise | John Norcini | 1995 94 |
| Outcome and competency-based education | Jason Frank, Ronald Harden, Carol Carraccio | 1996 95-98 |
| Teaching and assessing professionalism | Richard and Sylvia Cruess, Brian Hodges | 1997 99,100 |
| Interprofessional education | Scott Reeves, Hugh Barr | 1998 101,102 |
| Simulation technology | Barry Issenberg, William C McGaghie, Amitai Ziv | 1999 103,104 |
| Multiple-Mini Interview selection method | Kevin Eva | 2004 105 |
| Entrustable Professional Activities | Olle ten Cate | 2005 106 |
| Programmatic Assessment | Cees van der Vleuten, Lambert Schuwirth | 2005 107 |
| Learner burn-out and depression studies | Tait Shanafelt, Lotte Dyrbye | 2005 108 |
| Relating education to clinical outcomes | David Asch | 2009 109,110 |
| Resident duty hours effects | Karl Billimoria, Sanjay Desai, David Asch | 2016 111,112 |

3.2 | Integration

Integration pertains to the consolidation of new findings within and across disciplines. The exemplary advances shown in Table 1 have specifically been developed for health professions education, and many had significant impact in a wider community than only medical education or the health professions, such as problem-based learning.⁴⁴ Some advances, such as the introduction of Patient Management Problems for the assessment of clinical reasoning skill (by Christine McGuire and colleagues) were abandoned⁴⁵ and replaced by newer methods after research had revealed inadequacies. But Key-Feature items (more or less their successor)⁴⁶ would have never been introduced without its precursory grounding. This example of consolidation is a testimony of a self-developing scholarly tradition in medical education.

Consolidation has translated in the establishment of a steady proliferation of dedicated health professions education scholarship units that build a tradition of research.⁴⁷ In the 1980s, such units were just few in North America and Europe, but in 2000 North America had 61 units⁴⁸ and 2020 there are countless units in several countries worldwide. The Society of Directors of Medical Education Research currently lists 78 members directing such units, and many directors are not SDRME members. These units typically employ scientists, scholarly educators, and administrative leaders, involved in research, faculty development (teaching), and service.^{49,50}

Integration also speaks to the cross-fertilization of different domains of sciences. Health professions scholarship has hugely benefited from the social sciences. Norman has qualified the contributions made by scholars with a nonmedical background as made by “immigrants” in the health professions domain: psychologists, sociologists, and psychometricians. He saw a strong wave of these scholars in the 1980s and 1990s,⁴⁵ adapting their skills to serve HPE. Only few of these remained outside observers, studying HPE as a topic of research, as would an anthropologist do, without becoming part of it. Rather, PhD level social scientists were hired by medical schools, and integrated in their communities, to support the quality development of their education, in close collaboration with medical and biomedical experts. This has significantly stimulated the integration of theories of learning, education, and psychology in the development and practice of health professions education. The number of journal article titles combining “medical,” “education,” and “theory” has exponentially grown across the six decades since 1960 (from 3, via 7, 11, 31, 96, to 195 in 2020) (Google Scholar). The integration made a further step in what Norman called “third generation” scholars, not immigrants but medically trained, and supplemented with HPE scholarship training in an own tradition of dedicated HPE Masters and PhD education, with its pros (being highly specialized without an ivory tower stance) and cons (with less depth of experience and background in

other disciplines).⁴⁵ Another important influence regards the methodology of research. HPE research has seen a significant increase of qualitative studies,^{51,52} reflecting the awareness of the limitations of controlled experiments.^{36,53}

Are there limitations of Boyer's sense of integration with regards to health professions education scholarship? One hallmark of maturation of a professional domain, the establishment of specialized journals, paradoxically shows a hesitation to integrate with other disciplines. Comparatively very little about health professions education is published in journals of the social sciences. It shows how HPE scholars may be less inclined to read and publish in these journals, and how readers of these journal may be less interested in HPE. The largest community of educational scholars is arguably the American Educational Research Association (AERA), with an annual meeting that brings together 10,000–15,000 scholars. HPE scholars are represented in AERA, but interact largely within one division of it, that of “*The Professions*”, dominated by HPE scholars. In contrast, some topics may simply be better represented in the HPE literature than in other educational literature. As an example, Van Dijk et al., searching for frameworks of university teaching tasks identified 46 in an extensive literature review, 18 of which pertained to medical faculty and 6 more to other health professions including nursing, dentistry, pharmacy, and midwifery.⁵⁴

To conclude, integration has happened internally, through consolidation of innovations and findings, but integration with other disciplines has been limited.

3.3 | Application

In health professions education scholarship, research and development go hand-in-hand. *Application* is a core characteristic. The vast majority of scholars involved in HPE research have roles in education, either as clinicians, as teachers, or both; as course or program directors or as administrative officers, such as associate deans. While educational scientists in university faculties of social science, may never have been primary or secondary school teachers (even if that is their domain of study) and may be criticized for ivory tower science, HPE researchers are very often active teachers, active faculty developers, active

curriculum and course developers with clinical or biomedical research experience. Many scholarly HP educators have initially built a career in patient care or the basic sciences and developed as scholarly educators only at a later stage, as a second career.

The reason why the application criterion of scholarship in HPE may be stronger than in other higher education domains is a clear societal desire for high-quality health care. Health care affects everyone, and requires societal trust to operate, a trust that primarily focuses on care providers and their presumed education. The many reports, across several decades, advocating for improvement of medical training led Christakis to conclude in 1995 that they all “articulate a specifically social vision of the medical profession, in which medical schools are seen as serving society [...] with a remarkable consistency, [...] to better serve the public interest, to address physician workforce needs, to cope with burgeoning medical knowledge, and to increase the emphasis on generalism. [Recommendations to] increase generalist training, increase ambulatory care exposure, provide social science courses, teach life-long and self-learning skills, reward teaching, clarify the school mission, and centralize curriculum control have appeared almost continuously since 1910”,⁵⁵ conclusions that easily extend to subsequent calls for medical education reforms after 1995.^{42,43,56}

Health professions education scholarship is an exemplar of an applied science and cannot be viewed as a pure science, because of its continuous focus on application. Of all current publications in the major HPE journals, the majority are not research reports, but perspective articles, guidelines, and reviews. They serve to advance education and are highly useful, and show that application is central to the HPE scholarly domain.

3.4 | Teaching and scholarly communication

Boyer's fourth criterion of scholarship is *Teaching*, or, interpreted more broadly, the communication of knowledge, insight, and discovery, to the community at large and to junior generations of scholars. Not only the number of journals and publications increased significantly; local, national, and international conferences in medical education—virtually nonexistent before 1970, increased rapidly in number and size (Table 2).

| Conference | Hosted by | Attendees* |
|-------------------|---|------------|
| AMEE conference | Association of Medical Education in Europe | 3,808 |
| Ottawa conference | Association of Medical Education in Europe | ~1,000 |
| IAMSE conference | International Association of Medical Science Educators | 660 |
| APMEC conference | National University of Singapore in international collaboration | 1,421 |
| ICME conference | Riphah International University Pakistan in international collaboration | 908 |

TABLE 2 Major international HPE conferences

*2019; 2018 for biennial Ottawa conference.

The largest international HPE society by members and conference attendees is the Association of Medical Education in Europe (AMEE). Its annual conference has grown since its inception in 1973 into a global conference with a majority of attendees from outside Europe.⁵⁷ AMEE offers a variety of other services to foster the quality of medical and health professions education (journals, webinars, certificate courses, resources including guidelines and reviews, awards, prizes, and small grants, fellowship member options). Their website lists 37 smaller active national and international societies and associations for medical or health professions education (www.AMEE.org). Many of these also hold annual national or regional conferences. Some national HPE conferences exceed international conferences. The Association of American Medical Colleges received 4490 participants at their 2019 annual meeting, but educational research has less emphasis at AAMC meetings; the Dutch annual 2-day HPE conference has received a stable number of 900–1000 participants annually across the past decade.

Teaching, more specifically, involves educating future generations in a specific domain. While the object of educational scholarship includes teaching, teaching new generations of scholars is something different. So the question is: to what extent has the HPE community invested in teaching the content and methods of HPE scholarship? The first generations of HPE scholars with a medical background have trained themselves in educational methods or spent time to obtain an advanced degree in schools of educational or social sciences. This has shifted in the 1990s, when advanced academic degree programs began to be offered by units of

health professions education scholarship, and serious attention for teacher careers in medical schools emerged.⁵⁸ The establishment of dedicated professor and associate professor positions in health professions education, providing an alternative career opportunity for clinical and nonclinical faculty members,⁵⁹ and the establishment of Academies as educational communities within medical schools for early career or distinguished educators⁶⁰ has further fostered this. Masters and PhD programs enable this continued professional development in scholarship. The number of masters level programs in HPE increased from 7 in the year 1996 to 76 in the year 2012⁶¹ and 139 in the year 2020 (www.faimer.org) and the number of structured doctoral programs was calculated to be 24 in the year 2014⁶² and 26 in the year 2020 (www.faimer.org). The numbers of students trained in these units also expanded significantly. As an example, the number of active PhD students in Maastricht University's School of Health Professions Education increased in the past decade from 25 to 100.⁶³ Expanded international collaborations foster such increases as programs become less and less confined to one location.⁶⁴ A few countries have excelled in leadership in this movement. Since 1960 the United Kingdom, Canada, and the USA, followed by the Netherlands and Australia have promoted scholarship in health professions education. Measured by productivity per medical school, that is, considering the size of the country, Canada and the Netherlands have shown the highest relative HPE research productivity across the past decade and a half, and often provided senior authorships on journal articles (Table 4), to be interpreted as a sign of international research mentorship (Table 3).

TABLE 3 Publications during the period of 2006–2019 according to the country of the first author

| | USA | CA | UK | NL | AUS/ NZ | Others | Total |
|--------------------------------------|-------|------|------|------|------------|--------|-------|
| 2006–2011 Journal data a–d total* | 1,778 | 423 | 603 | 239 | 187 | 555 | 3,785 |
| 2012–2019 Journal data | | | | | | | |
| a. Medical Education | 247 | 277 | 215 | 103 | 155 | 128 | 1,145 |
| b. Academic Medicine | 1,732 | 257 | 35 | 62 | 22 | 49 | 2,163 |
| c. Medical Teacher | 384 | 204 | 286 | 123 | 154 | 317 | 1,468 |
| d. Adv. Health Sci. Educ. | 100 | 146 | 54 | 90 | 56 | 105 | 559 |
| total 2006–2019 | 4,241 | 1307 | 1193 | 617 | 574 | 1154 | 9,086 |
| Mean per year | 302,9 | 93,4 | 85,2 | 44,1 | 41,0 | 82,4 | 649,0 |
| Percentage of total | 46,7 | 14,4 | 13,1 | 6,8 | 6,3 | 12,7 | 100,0 |
| Number of medical schools** | 197 | 17 | 61 | 8 | 27 | 2,571 | 2,881 |
| Relative Publication Productivity | 21,5 | 76,9 | 19,6 | 77,1 | 21,3 | 0,4 | 3,2 |

*Jaarsma et al. 2013.⁶⁵

**WFME/Faimer World Directory of Medical Schools 2018; Rizwan et al. 2018.⁵

| | USA | CA | UK | NL | AUS/ NZ | Other |
|--|-------|-------|-------|------|------------|-------|
| Publications with first author from this country | 4,241 | 1,307 | 1,193 | 617 | 574 | 1,154 |
| Publications with last author from this country | 2,182 | 808 | 505 | 423 | 328 | 485 |
| Relative difference | 0.51 | 0.62 | 0.42 | 0.69 | 0.57 | 0.42 |

TABLE 4 First and last authors of publications during 2006–2011 according to nationality

In some countries, such as the Netherlands, professor positions include the formal right and expectation to supervise doctoral students in their domain of expertise, individually or in structured programs. In health professions education, the increase of such chairs has had the catalytic effect of increased numbers of PhD students in HPE which. Combined with government funding of university research based on PhD graduations, this may explain the prolific production of health professions education research in the Netherlands.⁶⁵

Boyer's *teaching* criterion, no doubt, has been met, not only locally, but also at the international level.

4 | CONCLUSION AND OUTLOOK

The analysis of the development and current status of health professional education scholarship would undeniably qualify it as meeting all of Ernest Boyer's criteria of mature scholarly discipline. HPE scholarly units can become academic departments and a relevant question is then where in universities such departments or units belong.⁵⁰ Rather than in faculties or departments of social or educational sciences, schools in the health professions have established and hosted such units and should host them. Situated in close vicinity to the practice of health care seems to have been a critical condition for these units to flourish, combined with the insights of the social sciences.⁶⁶ HPE research should be best conducted by scholars with a mindset to understand what it is to *think, act, and feel* like a physician, nurse, or other health professional, in other words to possess, or at least sympathize, with professional identities in health care.⁶⁷

The growth of health professions education scholarship activities and interest since mid-20th century (journals, publications, conferences, HPE research, and development centers, scholars) has out-paced similar developments in other higher education domains. The quest for optimal health care, and consequently, for well-prepared health care professionals may have benefited from a clear educational focus that combines societal impact, professional esteem, and clarity of occupations with insights from educational theory and research methodology that lacked 70 years ago.

While during the early decades a few enlightened individuals had a major impact on the growth and direction of HPE scholarship, the number of scholars now has likely passed

the pivotal critical mass to keep the domain sustainable for a long time.

Speculating what HPE scholarship will look like in the future must take the expected developments of the object of this scholarship into account. Health care will definitely change, not only because of scientific and technological advances, but also because of demographic and epidemiologic changes.^{68,69} Demographics, artificial intelligence, genomics, regenerative medicine, and precision medicine have been called disruptors of current health care.⁶⁹ The recent disruption by the Covid-19 pandemic has stirred further thinking about the future of health care and education, for example, to include tele-health care provision, bringing new demands for training and assessment.⁷⁰⁻⁷³ A recent international survey among 51 health professions thought leaders suggested significant upcoming developments, in competency-based, time variable education; in simulation; in methods and criteria for selection for undergraduate and postgraduate education; increased global collaboration and exchange; more focus on skills in prevention, and interprofessional, team-based and community-based care, and on a changing relationship with patients.⁷⁴ The continuous superspecialization and fragmentation of the medical domain poses threats to education that must be dealt with. Calls for more integrated, coherent, holistic, systems approaches to biology, health care, and its education can be found in the literature.^{45,75,76}

While these will all affect the work of health professionals education scholars, HPE scholarship in itself will likely continue to show quantitative and qualitative development. In their analysis of the future of medical education,⁷⁷ Bleakley et al. (page 222–225) elaborate a five-point agenda for improvement of medical

education research (slightly amended): (1) a focus on conceptual questions and clarifications and deciding on what counts as evidence, (2) building programs of systematic research rather than conducting just opportunistic studies, (3) more rigorous outcome-based research, (4) building better expertise in combined qualitative and quantitative (mixed methods) research, and (5) creating a productive dialog between the academic and clinical communities.⁷⁷ These are valuable recommendations that may be supplemented with a stronger faculty development focus to breed future generations of scholars.

Asclepius would be surprised to know how his symbols of snake and rod as well as the obligation to teach—an inherent task of health professionals, incorporated in Hippocrates' oath—have led to a lively community of scholarly educators several millennia later. The common pursuit, then and now, for the best qualified health professionals has not changed. While researchers and scholars develop visions that suggest that the ultimate goal of a competent health care workforce may be attainable and fuel the continued innovation in medical education, it may be the *pathway* rather than an attainable endpoint that characterizes scholarship. While "the competent health professional," molded by optimal education, may seem a Holy Grail, the quest for it is served by scholarship according to Boyer's criteria. The pathway shows ups and downs,⁷⁸ and the interest of schools, hospitals, and regulatory bodies in this competent workforce, has led, in the words of Woolliscroft, to "unintended consequences" of financing, efficiency, and legal constraints.⁶⁹ Scholars are needed to discern these consequences and recommend routes to overcome them. This amalgam of dynamics is bound to keep challenging future scholars to create and test ongoing innovations in health professions education, to the benefit of learners, clinicians, patients, and society.

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CONFLICT OF INTEREST

This paper has been submitted simultaneously to the journal *Beiträge zur Hochschulforschung*.

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ENDNOTES

^a Historically, medical education has first developed a scholarly tradition, and is current transitioning to or being renamed as the broader field of health professions education, as nursing, veterinary medicine, dentistry, pharmacy, and other health professions have become scholarly active, predominantly in the 21st century. With the establishment of a new journal *Advances in Health Sciences Education* in 1995 the labeling of this domain of scholarship began to shift from *medical* toward *health sciences* or *health professions*. In this paper, both terminologies are being used more or less interchangeably, depending on the context.

^b A list can be obtained from the author.

REFERENCES

- Lyons AS, Petrucelli RJ. *Medicine*. New York: An Illustrated History. Harry N. Abrams Inc.; 1987.
- Lindeboom GA. Herman Boerhaave (1668–1738). *Teacher of All Europe*. *JAMA*. 1968;206:2279-2301.
- Bliss M. William Osler at 150. *Can. Med. Assoc. J.* 1999;161:831-834.
- Ludmerer KM. *Time to Heal*. Oxford: Oxford University Press; 1999.
- Rizwan M, Rosson NJ, Tackett S, Hassoun HT. Globalization of medical education: Current trends and opportunities for medical students. *J. Med. Educ. Train.* 2018;2:035.
- Ludmerer KM. *Learning to Heal. The development of American medical education*. Baltimore: The Johns Hopkins University Press; 1985.
- Flexner A. *Medical education in the United States and Canada: a report to the Carnegie Foundation for the Advancement of Teaching*. 1910.
- Custers EJFM. Commentary: Flexner and Dutch medical education: A misinterpretation? *Acad. Med.* 2010;85:1672-1674.
- Hammond K, Kern F, Crow W, et al. *Teaching Comprehensive Medical Care*. Cambridge, Massachusetts: Harvard University Press; 1959.
- Williams G. *Western Reserve's Experiment in Medical Education and Its Outcome*. New York: Oxford University Press; 1980.
- Abrahamson S. Offices of research in medical education: "What have you guys even done anyway?". *Acad. Med.* 1991;66:S89-S92.
- Miller GE. A Perspective on research in medical education. *J. Med. Educ.* 1970;45:694-699.
- Merton R, Reader G, Kendall P, eds. *The Student Physician. Introductory Studies in the Sociology of Medical Education*. Cambridge, Massachusetts: Harvard University Press; 1957.
- Eron LD. Effect of medical education on medical students' attitudes. *J. Med. Educ.* 1955;30:559-566.
- Becker HS, Geer B, Hughes E, Strauss AL. *Boys in White. Student Culture in Medical School*. New Brunswick, NJ: University of Chicago Press; 1961.
- Ajjawi R, Crampton PES, Rees CE. What really matters for successful research environments? A realist synthesis. *Med. Educ.* 2018;52:936-950.
- Boyer EL. *Scholarship Reconsidered - Priorities of the Professoriate*. Princeton, New Jersey: Carnegie Foundation for the Advancement of Teaching; 1990.
- Glassick CE. Boyer's expanded definitions of scholarship, the standards for assessing scholarship, and the elusiveness of the scholarship of teaching. *Acad. Med.* 2000;75:877-880.
- O'Brien BC, Irby DM, Durning SJ, et al. Boyer and beyond: An interview study of health professions education scholarship units in the united states and a synthetic framework for scholarship at the unit level. *Acad. Med.* 2019;94:893-901.
- Hornsey MJ. Social identity theory and self-categorization theory: A historical review. *Soc. Personal. Psychol. Compass.* 2008;2:204-222.
- Turner J. Towards a cognitive redefinition of the social group. In: Tajfel H, ed. *Social Identity and Intergroup Relations*. Cambridge: Cambridge University Press; 1982:15-40.
- Jason H. Celebrating 40 years of medical teacher: As the "last man standing" I look back to help us look forward. *Med. Teach.* 2018;40:331-336.
- Rotgans JI. The themes, institutions, and people of medical education research 1988–2010: Content analysis of abstracts from six journals. *Adv. Heal. Sci. Educ.* 2012;17:515-527.

24. Albert M, Hodges B, Regehr G. Research in medical education: balancing service and science. *Adv. Heal. Sci. Educ. theory Pract.* 2007;12:103-115.
25. De Landesheere G. Educational research, history of. In: Husen T, Postlethwaite TN, eds. *The International Encyclopedia of Education Research and Studies*. Oxford: Pergamon Press; 1985:1588-1596.
26. Schunk DH. *Learning Theories - an Educational Perspective*. Boston MA: Pearson Education Inc; 2012.
27. Sawyer RK. The new science of learning. In: Sawyer RK, ed. *The Cambridge Handbook of The Learning Sciences*, Cambridge: Cambridge University Press; 2006:1-16.
28. Bransford JD, Brown AL, Cocking RR, eds. *How People Learn*. Washington DC: National Academy Press; 2000.
29. Ambrose S, Bridges M, DiPietro M, Lovett M, Norman M. *How Learning Works - Seven Research-Based Principles for Smart Teaching*. San Francisco: John Wiley & Sons Inc.; 2010.
30. Colvin Clark R, Mayer RE. *e-Learning and the Science of Instruction - Proven Guidelines for Consumers and Designers of Multimedia Learning*. Hoboken, NJ: John Wiley & Sons Inc; 2016.
31. Teunissen PW, Westerman M. Junior doctors caught in the clash: The transition from learning to working explored. *Med. Educ.* 2011;45:968-970.
32. ten Cate OTJ, Kusurkar RA, Williams GC. How self-determination theory can assist our understanding of the teaching and learning processes in medical education. AMEE Guide No. 59. *Med. Teach.* 2011;33:961-973.
33. ten Cate O. What happens to the student? the neglected variable in educational outcome research. *Adv. Heal. Sci. Educ.* 2001;6:81-88.
34. Bleakley A. Broadening conceptions of learning in medical education: the message from teamworking. *Med. Educ.* 2006;40:150-157.
35. Schumacher DJ, Dornoff E, Carraccio C, et al. The power of contribution and attribution in assessing educational outcomes for individuals, teams, and programs. *Acad. Med.* 2020;95:1014-1019.
36. Regehr G. It's NOT rocket science: Rethinking our metaphors for research in health professions education. *Med. Educ.* 2010;44:31-39.
37. Thistlethwaite J, Hammick M. The best evidence medical education (BEME) collaboration: Into the next decade. *Med. Teach.* 2010;32:880-882.
38. Lingard L. Paradoxical truths and persistent myths. *J. Contin. Educ. Health Prof.* 2016;36:S19-S21.
39. de Bruin ABH. Debunking myths in medical education: The science of refutation. *Med. Educ.* 2020;54:6-8.
40. Norman G. May: a month of myths. *Adv. Heal. Sci. Educ.* 2018;23:449-453.
41. Paton M, Kuper A, Paradis E, Feilchenfeld Z, Whitehead CR. Tackling the void: the importance of addressing absences in the field of health professions education research. *Adv Health Sci Educ.* 2021;26(1):5-18.
42. Frenk J, Chen L, Bhutta ZA, et al. Health professionals for a new century: Transforming education to strengthen health systems in an interdependent world. *Lancet.* 2010;376:1923-1958.
43. Cooke M, Irby D, O'Brien BC, Dooley-Hash S. Educating physicians: A call for reform of medical school and residency. *JAMA.* 2010;304:1240-1241.
44. Loyens SMM, Kirschner PA, Paas F. Problem-based learning. In: Harris KRS, Graham T, Urdan AG, Bus A, Major S, Swanson HL, eds. *APA handbooks in psychology®. APA educational psychology handbook. Vol. 3. Application to learning and teaching*. American Psychological Association; 2012:403-425.
45. Norman G. Fifty years of medical education research: Waves of migration. *Med. Educ.* 2011;45:785-791.
46. Bordage G, Page G. An alternative to PMPs: The "key feature concept". In: Hart I, Harden R, eds. *Further Developments in Assessing Clinical Competence*. Ottawa: Can-Heal Publications; 1987:59-75.
47. Davis MH, Karunathilake I, Harden RM. AMEE Education Guide no. 28: The development and role of departments of medical education. *Med. Teach.* 2005;27:665-675.
48. Albanese MA, Dottl S, Nowacek GA. Offices of research in medical education: accomplishments and added value contributions. *Teach. Learn. Med.* 2001;13:258-267.
49. Varpio L, O'Brien B, Hu W, et al. Exploring the institutional logics of health professions education scholarship units. *Med. Educ.* 2017;51:755-767.
50. Varpio L, Gruppen L, Hu W, et al. Working definitions of the roles and an organizational structure in health professions education scholarship: Initiating an international conversation. *Acad. Med.* 2017;92:205-208.
51. Kennedy TJJ, Lingard LA. Making sense of grounded theory in medical education. *Med. Educ.* 2006;40:101-108.
52. Thompson-Burdine J, Thorne S, Sandhu G. Interpretive description: A flexible qualitative methodology for medical education research. *Med Educ.* 2021;55(3):336-343.
53. Norman G. RCT = results confounded and trivial: The perils of grand educational experiments. *Med. Educ.* 2003;37:582-584.
54. van Dijk E, van Tartwijk J, van der Schaaf M, Kluijtmans M. What makes an expert university teacher? A systematic review and synthesis of frameworks for teacher expertise in higher education. *Educ. Res. Rev.* 2020;31:100365.
55. Christakis NA. The similarity and frequency of proposals to reform US medical education: Constant concerns. *J. Am. Med. Assoc.* 1995;274:706-711.
56. Irby DM, Cooke M, Brien BCO. Calls for reform of medical education by the Carnegie Foundation for the Advancement of Teaching: 1910 and 2010. *Acad. Med.* 2010;85:220-227.
57. Wojtczak A. AMEE Occasional Paper 5: History of AMEE. 2013:1972-2009.
58. Irby DM, O'Sullivan PS. Developing and rewarding teachers as educators and scholars: remarkable progress and daunting challenges. *Med. Educ.* 2018;52:58-67.
59. Alexandraki I, Mooradian A. Academic advancement of clinician educators: why is it so difficult? *Int. J. Clin. Pract.* 2011;65:1118-1125.
60. Irby DM, Cooke M, Lowenstein D, Richards B. The academy movement: a structural approach to reinvigorating the educational mission. *Acad. Med.* 2004;79:729-736.
61. Tekian A, Harris I. Preparing health professions education leaders worldwide: A description of masters-level programs. *Med. Teach.* 2012;34:52-58.
62. Tekian A. Doctoral programs in health professions education. *Med. Teach.* 2014;36:73-81.
63. van Merriënboer JJJ. *Goodbye and Hello from your Research Director*. Maastricht SHE News; 2020.
64. NN. UMC. Utrecht - UCSF Doctoral Program In Health Professions Education PhD Candidate Guide. *Univ. Calif. San Fr. Sch. Med. Cent. Fac. Educ.*

65. Jaarsma D, Scherpbier A, van der Vleuten C, ten Cate O. Stimulating medical education research in the Netherlands. *Med. Teach.* 2013;35:277-281.
66. Schmidt HG, Mamede S. How cognitive psychology changed the face of medical education research. *Adv. Heal. Sci. Educ.* 2020;25:1025-1043.
67. Cruess RL, Cruess SR, Boudreau JD, Snell L, Steinert Y. Reframing medical education to support professional identity formation. *Acad. Med.* 2014;89:1446-1451.
68. Wachter R. *The Digital Doctor. Hope, Hype, and Harm, at the Dawn of Medicine's.* New York: Computer Age. McGraw-Hill; 2015.
69. Woolliscroft JO. *Implementing Biomedical Innovations into Health Education, and Practice.* Preparing Tomorrow's Physicians: Academic Press / Elsevier, London; 2020.
70. Wijesooriya NR, Mishra V, Brand PLP, Rubin BK. COVID-19 and telehealth, education, and research adaptations. *Paediatr. Respir. Rev.* 2020;35:38-42.
71. Hauer KE, Lockspeiser TM, Chen HC. The COVID-19 pandemic as an imperative to advance medical student assessment. *Acad. Med.* 2021 Feb 1;96(2):182-185.
72. ten Cate O, Schultz K, Frank JR, Hennis MP, Ross S, Schumacher DJ, Snell LS, Whelan A, Young JQ. Questioning Medical Competence: Should the COVID-19 Crisis Affect the Goals of Medical Education? 2021; Submitted.
73. Wanjek C. Systems biology as defined by NIH: An intellectual resource for integrative biology. *NIH Catal.* 2011;19:1.
74. ten Cate O, Carraccio C. Envisioning a true continuum of competency-based medical education, training and practice. *Acad. Med.* 2019;94:1283-1288.
75. Keegan DA, Bannister SL. More than moving online: Implications of the COVID-19 pandemic on curriculum development. *Med. Educ.* 2021;55:101-103.
76. O'Brien B, Forrest K, Wijnen-meijer M, ten Cate O. A global view of structures and trends in medical education. In: Swanwick T, Forrest K, O'Brien BC, eds. *Understanding Medical Education.* Wiley-Blackwell: Hoboken, NJ, USA; 2019:7-22.
77. Bleakley A, Bligh J, Browne J. *Medical Education for the Future - Identity.* Dordrecht: Power and Location. Springer Science+Business Media BV; 2011.
78. Touchie C, ten Cate O. The promise, perils, problems and progress of competency-based medical education. *Med. Educ.* 2016;50:93-100.
79. Barrows H, Abrahamson S. The programmed patient: A technique for appraising student performance in clinical neurology. *J. Med. Educ.* 1964;39:802-805.
80. Harden RMG, Downie WW, Stevenson M, Wilson GM. Assessment of clinical competence using objective structured examination. *Br. Med. J.* 1975;1:447-451.
81. Barrows H, Mitchell D. An innovative course in undergraduate neuroscience. Experiment in problem-based learning with "problem boxes". *Br. J. Med. Educ.* 1975;9:223-230.
82. Barrows H, Tamblyn R. *Problem-Based Learning.* New York: Springer Publishing Company Inc; 1980.
83. Norman GR, Schmidt HG. The psychological basis of problem-based learning: A review of the evidence. *Acad. Med.* 1992;67:557-565.
84. Elstein A, Shulman L, Sprafka S. *Medical Problem Solving. An Analysis of Clinical Reasoning:* Harvard University Press, Cambridge, Massachusetts; 1978.
85. Norman G, Tugwell P, Feightner J, Muzzin L, Jacoby L. Knowledge and clinical problem-solving. *Med. Educ.* 1985;19:344-356.
86. Verwijnen M, Imbos T, Snellen H, et al. The evaluation system at the medical school of maastricht. *Assess. Eval. High. Educ.* 1982;7:225-244.
87. Bordage G, Page G. The key-features approach to assess clinical decisions: validity evidence to date. *Adv. Heal. Sci. Educ.* 2018;23:1005-1036.
88. Skeff K, Campbell M, Stratos G, Jones H, Cooke M. Assessment by attending physicians of a seminar method to improve clinical teaching. *J. Med. Educ.* 1984;59:944-950.
89. Steinert Y. Faculty development in the new millennium: Key challenges and future directions. *Med. Teach.* 2000;22:44-50.
90. Irby DM, Ramsey PG, Gillmore G, Schaad D. Characteristics of effective clinical teachers of ambulatory care medicine. *Acad. Med.* 1991;66:54-55.
91. Hanson L, Talley R. South dakota's third-year program of integrated clerkships in ambulatory-care settings. *Acad. Med.* 1992;67:817-819.
92. Poncelet A, Hirsh D, eds. *Longitudinal integrated clerkships. In: Principles, outcomes, practical tools, and future directions.* North Syracuse: Gegesatz Press and Alliance for Clinical Education; 2016.
93. Hafferty FW, Franks R. The hidden curriculum, ethics teaching, and the structure of medical education. *Acad. Med.* 1994;69:861-871.
94. Norcini J, Blank L, Arnold G, Kimball H. The Mini-CEX (clinical evaluation exercise): A preliminary investigation. *Ann. Intern. Med.* 1995;123:795-799.
95. Harden JR, Crosby MH, Davis MRM. AMEE Guide No. 14: Outcome-based education: Part 5-From competency to meta-competency: a model for the specification of learning outcomes. *Med. Teach.* 1999;21:546-552.
96. Frank J, Jabbour M. *Skills for the new millennium: report of the societal needs working group - CanMEDS 2000 Project.* Ottawa, ON, Canada: Royal College of Physicians and Surgeons of Canada; 1996.
97. Carraccio C, Wolfsthal SD, Englander R, Ferentz K, Martin C. Shifting paradigms: from Flexner to competencies. *Acad. Med.* 2002;77:361-367.
98. McGaghie W, Miller G, Sajid A, Telder T. *Competency-based Curriculum Development in Medical Education - An Introduction.* Geneva: World Health Organization; 1978.
99. Cruess SR, Cruess RL. Professionalism must be taught. *Br. Med. J.* 1997;315:1674-1677.
100. Hodges BD, Ginsburg S, Cruess R, et al. Assessment of professionalism: Recommendations from the Ottawa 2010 Conference. *Med. Teach.* 2011;33:354-363.
101. Barr H. Competent to collaborate: towards a competency-based model for interprofessional education. *J. Interprof. Care.* 1998;12:181-187.
102. Reeves S, Perrier L, Goldman J, Freeth D, Zwarenstein M. Interprofessional education: Effects on professional practice and healthcare outcomes. *Cochrane Database Syst. Rev.* 2013;1-47.
103. Issenberg SB, McGaghie WC, Hart IR, et al. Simulation technology for health care professional skills training and assessment. *JAMA.* 1999;282:861-866.
104. Ziv A, Small SD, Wolpe PR. Patient safety and simulation-based medical education. *Med. Teach.* 2000;22:489-495.
105. Eva KW, Rosenfeld J, Reiter HI, Norman GR. An admissions OSCE: The multiple mini-interview. *Med. Educ.* 2004;38:314-326.

106. ten Cate O. Entrustability of professional activities and competency-based training. *Med. Educ.* 2005;39:1176-1177.
107. Van Der Vleuten CPM, Schuwirth LWT. Assessing professional competence: From methods to programmes. *Med. Educ.* 2005;39:309-317.
108. Dyrbye LN, Thomas MR, Shanafelt TD. Medical student distress: Causes, consequences, and proposed solutions. *Mayo Clin. Proc.* 2005;80:1613-1622.
109. Asch D, Nicholson S, Srinivas S, Herrin J, Epstein A. Evaluating obstetrical residency programs using patient outcomes. *JAMA J. Am. Med. Assoc.* 2009;302:1277-1283.
110. Asch DA, Nicholson S, Srinivas SK, Herrin J, Epstein AJ. How do you deliver a good obstetrician? Outcome-based evaluation of medical education. *Acad. Med.* 2014;89:24-26.
111. Bilimoria KY, Chung JW, Hedges LV, et al. National cluster-randomized trial of duty-hour flexibility in surgical training. *Obstet. Gynecol. Surv.* 2016;71:348-350.
112. Desai SV, Asch DA, Bellini LM, et al. Education outcomes in a duty-hour flexibility trial in internal medicine. *N. Engl. J. Med.* 2018;378:1494-1508.

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