

REVIEW

Trends in North American medical education

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Abstract. Medical education in the United States of America (USA), and worldwide, is increasingly concentrating on the process and outcome of the educational experience. The first efforts to substantially improve medical education in the USA resulted in the Flexner Report in the early 1900s. The release of this report led to significant advancements in the quality of curriculum content. However, in the past few decades there has been increasing realization that delivery of content will not, by itself, assure the development of excellent physicians. As a result, there has been an increasing emphasis on the process, and, most recently, the outcome, of medical education. Process movements have examined the context and methods for teaching and learning. The problem-based learning movement is perhaps the most widely-known example of process trends. The latest trends in USA medical education focus on the outcomes of the learning process. At the forefront of this movement is the American Council on Graduate Medical Education (ACGME), which accredits all USA post-graduate training programs. Recently, the ACGME has defined a set of six core clinical competencies that all graduates must demonstrate. A second emerging trend is inter-professional education. Increasingly, healthcare is provided by inter-professional healthcare team, and students must be competent to function effectively in this setting. Many academic health centers are developing joint curricula to address this need. Medical education has evolved from a primary focus on content to an emphasis on process of teaching and learning, and will increasingly concentrate on educational outcomes. (Keio J Med 54 (1): 22–28, March 2005)

Key words: medical education, history of medicine, medical school, curriculum development, inter-professional education

History of Medical Education in the USA

The best way to understand where medical education is headed is to begin with an examination of where it came from. To that end, we would like to briefly review the history of medical education in the United States of America (USA), as a means of understanding the context in which medical education is evolving.

In the seventeenth and eighteenth centuries, physicians in the United States were surgeons as well as apothecaries. Because there was little in the way of oversight, anyone could practice “medicine” and appropriate the title of “doctor.” Clergy often functioned in a physician’s role, as did both men and women of lower socioeconomic status. In order to make a living wage, doctors not only practiced medicine but also engaged in other enterprises such as selling coffee and

making women’s dresses. Slowly however, by the mid-nineteenth century, those who practiced medicine began to do so full-time and as a primary occupation.¹ Increasingly, Americans who had undergone an apprenticeship would also go to study more formally in Europe, and they were bringing back not only medical knowledge but methods of education.

By the end of the 19th century, there were three main routes to becoming a physician in America. The first was apprenticeship, the oldest training system available. A physician who felt in need of an assistant could find one by offering an apprenticeship position to a “likely youth.” Training was variable in terms of educational worth. An apprentice had access to his master’s library, but there was little, if anything, in the way of formal lecturing involved in the training. An apprentice “ran his master’s errands, washed the bot-

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ties, mixed the drugs, spread the plasters, and finally, as the stipulated term drew towards its close, actually took part in the daily practice of his preceptor.”²

The second training method available to students was the proprietary, or for-profit, school system. These schools, which were owned and run by practicing physicians, could be opened by any physician interested in doing so. They were often, but not necessarily, loosely affiliated with larger institutions who allowed these small schools the right to award degrees in their name. Students paid tuition to the school and in return received a series of lectures from the local physicians. Teaching in these schools was faculty-centered, and there was little in the way of admission criteria beyond the ability to pay the fees.²

Because faculty were seeing patients when not teaching, and derived most of their livelihood from that activity, content was delivered in lecture format, the most efficient teaching method available.³ The standard curriculum consisted of seven courses including anatomy, medical jurisprudence, surgery, and obstetrics.⁴ The lectures in the second term were identical to those in the first. The “school” itself usually consisted of a lecture room, a small library, and a space for anatomy. There was little oversight for these schools, and many state medical boards refused to accept their graduates.⁵

The final, and least common, path to becoming a doctor was through the University system. This system was originally designed to supplement the apprentice system,² where teaching was variable and inconsistent. The first of these schools, University of Pennsylvania, opened in 1765, followed by King’s College (now Columbia) in 1767 and Harvard in 1782.⁴ These schools eventually mixed both lecture and clinical experiences; Johns Hopkins was the first school to open its own hospital for clinical teaching in 1893. Once again admission criteria were quite variable. Initially, medical education was quite short: 16 weeks of lectures repeated during the next term.⁶ By the early 1900s the length of training had stretched to the 4-year curriculum currently in place.³ Tuition at Johns Hopkins Medical School was \$200 in 1907.⁷

By the turn of the 20th century, several breakthroughs had occurred in science and medicine. The Flexner Report argued that, “the fundamental science upon which medicine depends [had] been greatly extended.”² Medicine was developing a scientific basis, and there was an ever-expanding set of diagnostic and treatment options available to physicians and their patients. Koch’s Postulates, a set of procedures to isolate and identify the causative microbial agent in disease, had been developed by Robert Koch at the end of the nineteenth century; medicine was finally able to identify the causes of common illnesses.

At the same time, there was a growing concern that there was an overproduction of poorly qualified physicians. In addition, regular physicians were struggling to gain and consolidate respect and authority in the 19th century. National organizations such as the American Medical Association (AMA) developed a strong interest in improving and, to some extent standardizing, medical education as a means of addressing both of these concerns. By institutionalizing and licensing medical education and practice, authority and respect could be reliably transmitted from one group of physicians to the next.¹ As Paul Starr noted in his treatise on the rise of the American medical system, “from apprenticeship, a young man might get a certificate of proficiency, but from a school of medicine he could get a warrant of authority.¹”

Much of the newly-won authority of medicine rested upon its alliance with the scientific model, which was respected by the American population. The AMA was also seeking to eliminate schools that had not adopted this new rigorous paradigm for medical education through the standardization of the educational process. In 1904 the AMA created the Council on Medical Education (CME) to promote this restructuring.⁸

In 1908, the CME planned to undertake a survey of medical education in the United States to promote change and the acceptance of its “ideal” four year medical curriculum. The CME requested that the newly-formed Carnegie Foundation for the Advancement of Teaching lead the survey. Carnegie president Henry Pritchett chose Abraham Flexner, a noted educational theorist, to head the survey, possibly because he felt that any given physician might be perceived as biased. This partnership represents the first major collaboration between educators and physicians in the cause of medical education. Dr. Flexner visited all 155 American and Canadian medical schools over an 18 month period, rating them on five factors: entrance requirements, size and training of the faculty, size of endowment and tuition, quality of laboratories, and availability of a teaching hospital.^{8,9} In 1910, he produced his 363-page report, *Medical Education in the United States and Canada*. He provided overall recommendations for changes in medical education as well as individual “report cards” for each school. So enduring is this report that it is still available on-line via the Carnegie Foundation website.¹⁰

The Flexner Report, as it came to be known, led to some pivotal changes in the American medical system. First, between seven and twenty-two percent of all medical schools closed or merged at least partially as a result of the report.⁹ By 1927 there were only 71 USA medical colleges,¹¹ and we still have only 126 today despite the interval population increase. Secondly, proprietary medical schools and the apprentice system dis-

appeared within two decades of the report. Thirdly, the German model of blending bioscience with clinical work and the “scientific” reasoning process became firmly established as the dominant curricular model.^{6,12} Finally, there was an attempt to have medical educators gain the status of full-time university faculty, with most of their time (until recently) being spent on teaching and research rather than clinical care. This conversion from primarily clinicians to primarily faculty was not fully implemented until mid-century. The post-Flexner era also saw a dramatic rise in oversight of medical education and practice. In 1912, the National Confederation of State Medical Examining and Licensing Boards (established in 1891) and the American Confederation of Reciprocating Examining and Licensing Boards (established in 1902) merged to form the Federation of State Medical Boards.¹³ For the first time, there was national coordination of certification methods for individual physicians. By 1927 an early system for accreditation of post-graduate residency programs through specialty boards had begun, which some decades later became the Accreditation Council for Graduate Medical Education. Finally, in 1942 the American Medical Association and the Association of American Medical Colleges, which had until then evaluated medical schools separately, jointly formed the Liaison Committee on Medical Education as a single body to certify the quality of North American medical schools.¹⁴ Now, each level of medical education and practice, from medical school to post-graduate training to individual licensing for practice, is overseen by its own national body.

Since the Flexner Revolution, there have been two major curriculum movements in United States medical education: the organ-based reform and problem-based learning. The first curricular reform, the organ-based movement, developed in the 1950s as a response to the growing amount of biomedical knowledge as well as the disorganization inherent in a discipline-run curriculum.⁶ Topics were taught within the organ-system framework, and active learning techniques were encouraged. For example, the second year of medical school might consist of blocks of time, within which all material on one organ system is presented together. One such block would be cardiology; during the block the anatomy, pharmacology, pathophysiology, and in some cases even clinical exam skills would be taught.

This reform developed as an attempt to reduce the sheer amount of information that educators were attempting to transmit to their students and to better integrate the information remaining. In this “integrated” educational system, curricular content was overseen by interdepartmental topic committees rather than individual departments. As a result of this movement, curriculum control became more centralized within the

medical school rather than controlled separately by each department. There was improved coordination at the topic level but a separation of education from the daily routines and functions of a department.

The next major reform in medical education was the first one to focus on the process of medical education rather than the content itself. This reform, problem-based learning (PBL), is based upon several education theories. PBL was first introduced at McMaster University in Ontario, Canada in the late 1960s, largely through the efforts of Dr. Howard Barrows. PBL takes place in small, student-driven groups, maximizing active learning and problem-solving skills, using specially constructed patient cases designed to have learners utilize knowledge in context. PBL was originally developed utilizing several cognitive learning theories, and is the first major curricular reform to focus on how students learn rather than what information is presented. Most North American medical schools have used or are using PBL as a part of their curriculum. There is an ever-growing body of literature on the efficacy of PBL; as of July 2004, there were 1642 papers in Medline on PBL.

Current Structure of Medical Education in the United States

All medical students in the United States complete an undergraduate degree program (typically four years in length) prior to entering medical school. Students can earn any degree in any field they wish, as long as they take certain courses required by most medical schools for entrance. These courses include biochemistry, organic chemistry, and biology. Medical students are, on average, 23.7 years old when they begin training.¹⁵ There are nearly equal numbers of male and female medical students.¹⁶ The majority of students are Caucasian, with Asian and African Americans being the most common race and ethnic minorities represented.¹⁶

To this day, Dr. Flexner’s recommendations cast a long shadow over medical training in the United States. The basic curricular structure remains that of the four-year curriculum first proposed by the Council on Medical Education and championed by Dr. Flexner. The first two years, the “pre-clinical” experience, are still predominantly lecture-based and content-heavy in most medical schools. Students study topics including anatomy, pharmacology, physiology, pathology, microbiology, medical ethics, and histology in addition to learning to perform a history and physical examination. The last two years are spent on clinical rotations, fulfilling the place of apprenticeships (along with post-graduate training). Students take a combination of required and elective rotations. Required rotations

(“clerkships”) include medicine, pediatrics, surgery, and obstetrics and gynecology.

Current Trends in Undergraduate Medical Education

At the turn of the century, concern over the training of unqualified physicians and poor educational oversight led to the Flexner report and a significant standardization of medical content delivered nation-wide. However, in education, content is only part of the learning story. Educational theory and research notes that the methods used to teach information may have just as much to do with retention as the content itself. As a result of this insight, there are several major trends in medical education which focus on the process of education rather than the content itself.

Process Movements in North American Medical Education

Several recent trends in North American medical education have focused on the process of teaching and learning. These curricular reforms have focused on how we structure our curricula, where we teach our students, and on what basis we make decisions about our education programs.

In response to questions about how best to structure the medical curriculum, medical educators have focused their answers on curriculum integration. One such trend, course integration, is essentially an extension of the organ-based curriculum movement. Course integration involves teaching about the same topic from multiple disciplinary perspectives, for example, teaching anatomy of the shoulder alongside radiography and physical exam of the shoulder. A course integration strategy has been used to teach a range of content areas, such as social and behavioral sciences¹⁷ and musculoskeletal pathophysiology.¹⁸ Typically, course integration brings basic science content into a clinical or social context. We know from learning theory that learners are better able to apply newly acquired skills and knowledge if the context for learning is similar to the conditions under which they must eventually perform. Integrated course segments provide students the opportunity to learn together the knowledge and skills that they will apply together.

While course integration focuses on horizontal integration of the curriculum, or the integration of concurrent curriculum components, a second trend focuses on vertical integration. Vertical integration can be defined as coordination and sequencing of content areas longitudinally across a curriculum. Often, vertical integration efforts focus on areas that do not fall along traditional disciplinary lines.¹⁹ For example, a vertical curriculum thread on quality improvement might include the fol-

lowing components: basic concepts of quality improvement presented in a lecture format in year one of medical school; application of those concepts while students work on a quality improvement project in year three; and the learner leading a quality improvement team as a resident. This structure allows for repeated exposures to the content, with increasing complexity. Reports of vertical integration projects have focused on such content areas as cultural competence²⁰ and end-of-life care.²¹

The second education process issue relates to where our students should be educated. An increasing amount of patient care occurs in an outpatient setting. For example, so estimates indicate the as much as 60% of surgeries are now taking place in the ambulatory setting.^{22,23} In response to this trend, the education of medical students is also shifting to outpatient clinics. Current reports indicate that the percentage of time spent in ambulatory settings in required clerkships varies by specialty. For example, 93% of time in family practice clerkships, 25% of time in internal medicine clerkships, 35% of time in OB/Gyn clerkships, 42% of pediatric clerkships, and 33% of time surgery clerkships is spent in ambulatory settings.²⁴ This represents a gradual increase from a decade ago, when 90% of time in family practice clerkships, 35% in pediatric clerkships, 25% in OB-Gyn clerkships, 20% in internal medicine clerkships, and only 13% in surgery clerkships was spent in an ambulatory setting.²⁵ Some studies have documented that student learning and student perceptions of the quality of the learning experience is comparable for hospital-based and outpatient clerkships experiences.²⁶ However, logistical concerns about providing consistent experiences across sites remain.

The final process issue focuses on how we make decisions about our educational programs. A report from 1990 suggested that our curricular decisions may not always be based in existing evidence of educational effectiveness.²⁷ Since that time, there has been an increased emphasis both on the scholarship of teaching²⁸ and on best evidence medical education.^{29,30} The movement toward evidence-based clinical care has increased the interest of medical teachers in the use of evidence to make educational decisions. In order to encourage the use of evidence in education decision-making, it will be necessary to develop training programs for faculty and systems of incentives that encourage the use of evidence.³¹ Indeed, a number of certificate and degree programs currently exist to credential medical school faculty in education.^{32,33}

In addition to support for faculty, an increase in the quality of the evidence available will be necessary if we are to effectively employ an evidenced-based approach to our curriculum decisions. One recent review of reports of the effectiveness of continuing medical edu-

cation indicated that relatively few studies (18.9%) looked at the learner's application of the skills and knowledge taught, and even fewer (1.6%) measured changes in patient outcomes as a result of educational interventions.³⁴

Outcome Movements in North American Medical Education

Most recently educators and the public have begun to focus on the outcome that we would all most desire: assuring the development of competent, qualified physicians. In other words, the outcome of education is more important than the content or even the process, similar to physicians being more concerned with the patient outcomes than the actual treatment modality. The recent concern over educational outcomes has led to two major trends in medical education: competency-based education and interprofessional education.

Competency-based education

Traditionally, medical education, especially post-graduate education, has focused upon defining a period of time over which training takes place and the content delivered during that period.³⁵ At the conclusion of training, the trainee was considered "trained" and able to practice medicine. Competency-based education (CBE), however, "implies a training process that results in proven competency"³⁶ in certain skills and behaviors required to practice that profession. Each trainee would have to demonstrate the acquisition and application the required knowledge, skills, and behavior in order to complete training (or move to the next step in the curriculum).

Surgery programs likely have the most experience with this type of education,³⁶⁻³⁹ but more and more programs are experimenting with CBE as a means of assuring that their graduates are able to practice high-quality medicine. At the forefront of this movement, the Accreditation Council on Graduate Medical Education (ACGME) has recently defined a set of six core clinical competencies which it will use to accredit all post-graduate training programs.⁴⁰ All programs will have to demonstrate that their graduates have acquired certain skills, such as professionalism and patient care (as opposed to demonstrating that the program teaches these skills), in order to be accredited. It is a significant shift in the accreditation process: the programs much demonstrate what their trainees have learned rather than what they have taught. The American Association of Medical Colleges also support a shift to competency-based education and aligning those competencies with those of the ACGME.⁴¹

Implementing CBE requires that educators be able

to define the crucial knowledge, skills, attitudes, and behaviors that all graduates must be able to demonstrate at completion of their training.^{36,42,43} Training programs must then develop and implement valid, reliable, and practical evaluation tools in order to certify competency for each of those skills.^{36,43} These requirements are not as easy as it might seem on the surface. For example, how to you show a trainee is professional? What tests can a school use to ascertain the decision-making skills of its students? Additionally, despite best intentions, it is nearly impossible to remove personal opinion from the evaluation process, making reliability in measurement difficult to achieve. Finally, demands on faculty time are likely increase as a result of more oversight and assessment of clinical competence.⁴³

Despite the challenges of defining the critical skills and developing evaluation tools, CBE is likely to receive more attention in the coming years for several reasons. The most obvious, of course, is that post-graduate training programs are now mandated to focus on outcomes rather than curriculum delivery in order to maintain accreditation. Secondly, there is a public and professional push for the medical profession to assure the competency of its graduates.⁴⁴ Finally, it aligns the educational process with the desired outcomes, and should lead to a more active learning experience for the trainees.

Interprofessional education

Over the years, the face of healthcare has changed. Patients are living longer with complicated and chronic medical conditions such as diabetes and congestive heart failure. Increasingly, healthcare is practiced in teams of professionals, each working together for the common goal of good patient care for those with these conditions. There has been a growing realization that all healthcare professionals need to function well in a team, and have a clear understanding of their respective roles. They must be able to communicate clearly and professionally.

However, health professions students are trained separately for years, and then asked to function well as an integrated team. They have little to no understanding of each others' training, roles, strengths, and limitations. Students are rarely given training in team or leadership skills or conflict resolution. One method postulated to help develop team skills and an understanding of respective strengths is to train together. Interprofessional education (IPE) is an educational process through which students are provided with formal opportunities for shared or team learning.⁴⁵

This curricular movement, interprofessional education (IPE), is by no means entirely new. There were

considerable attempts made in the 1970s to advance this idea of training students from multiple professions together, but the movement stalled in the early 1980s.⁴⁶ In recent years educators in many settings have been tackling this complicated but intriguing educational technique as a means of assuring the desired outcome: health professions graduates that function well as a team. Interprofessional education can take place in the classroom or clinical setting. Examples include joint rotations in a geriatric clinic⁴⁷ and joint ethics courses for students from multiple health professions.⁴⁸

Indeed, several national and governmental organizations have championed IPE as a means of creating more efficient, safe, and satisfying healthcare systems.^{49–51} Academic medical centers across North America and in Europe are reconsidering the most effective IPE methods. Programs are being piloted at many institutions, and several Academic Health Centers have developed Centers for Interprofessional Education.^{52–54}

One determinate of whether this IPE movement will be longer lasting than that of a generation ago will be demonstration of convincing quality outcomes. While there has been evaluation of many IPE programs,^{47,55–57} it has typically been at the level of the individual students rather than at the programmatic or patient levels; most student evaluation centers around attitudes and satisfaction with the learning experience. A recent review on the subject of IPE was unable to find a single paper meeting the inclusion criteria of assessing patient satisfaction or outcomes.⁵⁸ Another systematic review did support a positive change in the knowledge, skills, and attitudes of health professions students, but was unable to demonstrate change in actual practice behavior.⁵⁹ Clearly, as with competency-based education, a shift to a concern with outcomes will necessitate an increased level of sophistication with regards to curricular evaluation.

Conclusion

Medical education in the United States and Canada has evolved dramatically over the centuries. What was originally a haphazard educational process dependent upon the good will of the educator has become a complicated system full of standards and oversight. The curricular movements of this century have shifted the educators' focus from medical content to the process of education itself. Most recently, attention has turned to assuring the outcomes of the training process. The increasing focus on process and outcomes will demand that the medical system further define what it means to be a competent physician and develop valid, reliable, and practical evaluation methods for students and programs. Educators are fortunate to be teaching during a

time of such promise and change, and must rise to the challenge of helping to train the next generation of healers.

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