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Training physicians for the future US Health Care System

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ABSTRACT

Changes in US medical education have not yet paralleled the extraordinary recent advances in biomedical science. This is about to change with recent innovations in undergraduate medical education (UME) pedagogy. These changes include the 'flipped classroom,' new Liaison Committee on Medical Education requirements for learners to function collaboratively on health care teams that include other health professionals, the comprehensive development of professional identity in learning communities and adoption of measurable outcomes, termed 'entrustable professional activities'. These innovations offer the opportunity for a consistent longitudinal educational continuum in the US from UME to Graduate Medical Education (GME) and continuing medical education (CME). Such innovation addresses both individual patient and population health, with the potential for increasing shared decision-making and patient satisfaction. These innovations in US medical education have the potential to address the Institute for Healthcare Improvement's triple aim of improving patient care, improving the health of populations and reducing the per capita cost of health care.

KEYWORDS: US undergraduate medical education (UME), interprofessional education (IPE), learning communities (LC), entrustable professional activities (EPAs), Institute for HealthCare Improvement (IHI), triple aim

Introduction

Advances in biomedical science have revolutionised the approach to health in the last century. We are able to cure, or hold in abeyance, many types of diseases that were lethal in the early twentieth century with innovations ranging from targeted treatment of infections to targeted treatments of cancer. Until recently, there had not been similar advances in pedagogy in the US. We have followed the early twentieth century Flexnerian approach into the twenty-first century, with a period of didactic preclinical education followed by clinical experiences.[1,2] Although the current system has resulted in the training of a superb workforce, it is inflexible and insensitive to the skills and aspirations of individual learners. As biomedical knowledge accrues exponentially, the processes of critical reasoning, problem solving and dealing with uncertainty are more important to practicing physicians than medical fact memorisation. Indeed students often question the relevance of what they are being taught outside the clinical context. This is about to change.

The US is in the midst of a pedagogical revolution in medical education.[3,4] There are several key forces driving this change, including (1) current high costs yet significant variation in health care delivery, (2) a poor safety record in spite of a stated triple aim by the Institute for Healthcare Improvement (IHI) to improve the patient experience of care (quality and satisfaction), improve the health of populations and reduce the per capita cost of health care, and (3) innovative changes in medical care. Specifically, the US health care system is the most costly in the world, accounting for at least 17% of the gross domestic product, with estimates that percentage will grow to nearly 20% by 2020.[5] According to the World Health Organization, the US spends $8233 per capita, and the United Kingdom spends $3495 per capita.[6] This rise in health care costs is not sustainable. In addition, the quality, outcomes, and patient satisfaction associated with care are not consistent with the significantly increased cost. The US health care system lags behind much of the world in health care outcomes. Whether one looks at preventive care, eg immunisation rates, or outcomes, eg preterm deliveries, the US does not perform well.[7] Although the issues impacting quality and safety are likely to include access to care, as well as health literacy, there are also significant variations in both patient management and quality of care across multiple common disease states even in the presence of well established guidelines and best practices.[8,9] Perhaps not surprisingly, patients are not always satisfied with their experiences in the US health care system.

Challenges in meeting the need for primary care physicians

The current shortage of primary care physicians is likely to continue for several reasons, including (1) the significant financial gap between primary care physicians and specialists, (2) the powerful medical lobby that is led by specialists and (3) the ability of medical students to choose from the entire spectrum of medical specialties without strong incentives to choose primary care.

US specialists are very successful at the business of medicine in the US, increasing their revenues by introducing new

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procedures and carrying out more of the lucrative ones and lobbying aggressively via their medical societies.[10] Insurers pay less for traditional care, such as prescribing an antibiotic or performing a physical examination, than for procedures. Dermatologists are the fourth highest earners in the US at $471,555 (Medical Group Management Association), though their workload is one of the lightest. The Affordable Care Act also supports an increase in the dermatology market. For example, it requires 100% coverage for preventive dermatology screening sessions for seniors. The incomes of dermatologists, gastroenterologists and oncologists rose by more than 50% between 1995 and 2012, even when adjusted for inflation, whereas primary care physician incomes rose only 10%. Specialists typically earn two to four times as much as primary care physicians. These factors, in addition to the significant workload in primary care, likely play a role in the relatively low number of new physicians who practice primary care – about 25% – at the same time that the need for primary care physicians is projected to increase.

There were nearly 209,000 primary care physicians in 2010, but the US will require almost 52,000 additional primary care physicians by 2025. An increase of about 33,000 physicians is needed to meet population growth, about 10,000 to meet population aging, and about 8,000 to meet insurance expansion.[11,12] There is significant concern about the educational pipeline for primary care physicians. It is unclear what policies, if any, will be put into place to address this shortfall, but it is appropriate that they influence both medical student education and graduate medical education workforce policy. In addition to sheer numbers, there is significant concern about the current maldistribution of healthcare resources, including primary care, into major urban centers, leaving vast rural communities with an even more significant shortage.

The financial incentives work to increase the number of specialists. Some physicians in the US, who choose specialty careers, feel entitled to high fees because their medical education tuition costs are high. New doctors graduate with an average debt of at least $150,000. The US still needs to develop adequate financial and professional incentives to increase the number of primary care physicians.

Areas of innovation in undergraduate medical education

Changes in medical care offer opportunities for changes in medical education. The US is moving toward interprofessional team care provided in medical homes, the development of telehealth to reach even the most rural communities, and rapid methods to evaluate patient satisfaction.[13,14] These changes must be incorporated into educational redesign, to address not only the practice of medicine between an individual clinician and patient, but more broadly the contract between health professionals and society.

Innovations in medical education do not guarantee an improved health care system. First, medical education must integrate the advances in biomedical science with the development of critical reasoning. Then, clinicians must take a leadership role in addressing the multiple societal factors that challenge the US health care system in the twenty-first century, including high costs, health disparities in quality of care, and deficits in patient safety.

In the sections that follow, we will describe the goals, content and newer learning methodologies for undergraduate medical education in the US. The first section, 'Educational goals and content of undergraduate medical education', describes the competencies and milestones defined by the Accreditation Council for Graduate Medical Education (ACGME) for residency training, and their potential use in undergraduate medical education. It will also address entrustable professional activities (EPAs) which allow an expanded approach to communication and professionalism. Finally, it will review the importance of critical thinking, problem solving, lifelong learning and individualised paths to program completion. The second section, 'Newer learning methodologies and learning communities', will review the migration to student-centred, active learning – 'flipped classrooms', electronic record ergonomics, small group learning, longitudinal clinical experiences, consideration of competency-based rather than time-based learning, and the role of learning communities.

Educational goals and content of undergraduate medical education

The medical school accrediting body, the LCME, requires that medical schools have educational objectives grounded in outcomes, recognising that there must be measurable competencies demonstrating adequate preparation of learners for graduate medical education training. Many schools have used the six competency domains for graduate medical education introduced in 1999 and approved by the GME accrediting body (ACGME) in 2007 as a framework for their goals and content: patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism and systems-based practice.[15] More recently, milestones have been identified for the ACGME competencies, ie expectations of each specialty that can be demonstrated progressively by residents and fellows; these are to be implemented in 2013–2014.[16] ACGME milestones are receiving increasing attention by medical educators because there is growing concern by residency program directors that some medical school graduates are not yet prepared for residency. Requiring competency milestones for all medical students is the next natural step to address this problem.[17]

Entrustable professional activities

The Association of American Medical Colleges (AAMC) has recently convened a drafting panel to better define measurable competencies for medical graduates. Their guiding principles focus on meeting the health needs of the public and ensuring patient safety, and on measurable assessment using both formative, low-stakes assessments and final summative assessments. Of note, the UK General Medical Council (GMC) has developed outcomes and standards for undergraduate medical education.[18] Specific measureable outcomes are defined for the doctor as a scholar and a scientist, the doctor as a practitioner and the doctor as a professional. The standards developed by the GMC for UME include nine domains addressing the delivery of teaching, learning and assessment. These domains include such topics as patient safety, quality assurance, equality and diversity, student selection, design and delivery of the curriculum including assessment,

Box 1. The core entrustable professional activities for entering residency (CEPAER, AAMC 2013).

EPA 1: Gather a history and perform a physical examination

EPA 2: Develop a prioritised differential diagnosis and select a working diagnosis following a patient encounter

EPA 3: Recommend and interpret common diagnostic and screening tests

EPA 4: Enter and discuss patient orders/prescriptions

EPA 5: Provide documentation of a clinical encounter in written or electronic format

EPA 6: Provide an oral presentation/ summary of a patient encounter

EPA 7: Form clinical questions and retrieve high-quality evidence to advance patient care

EPA 8: Give or receive a patient handover to transition care responsibility to another health care provider or team

EPA 9: Participate as a contributing and integrated member of an interprofessional team

EPA 10: Recognise a patient requiring urgent or emergent care, initiative evaluation and treatment, and seek help

EPA 11: Obtain informed consent for tests and/or procedures that the day 1 intern is expected to perform or order without supervision

EPA 12: Perform general procedures of a physician

EPA 13: Identify system failures and contribute to a culture of safety and improvement

support and development of students, teachers and the local faculty, management of teaching, learning and assessment and educational resources and capacity. The US approach is described below and addresses many of the same domains.

The US AAMC drafting panel is currently defining measurable activities: 'all entering residents should be expected to perform on day one of residency without direct supervision.'[19] The AAMC has developed EPAs aligned with ACGME competencies and milestones. They have followed a modified Delphi process to prioritise these EPAs. Through this process 13 core entrustable professional activities for entering residency (CEPAERs) have been identified, ie unique, integrated units of professional work that can be used as a basis for workplace assessment and transition into practice (Box 1). Each of these EPAs has a description, each has been mapped to ACGME competencies, and each has a set of milestones. In addition, for each EPA there is both a bulleted list of expected behaviors for pre-entrustable and entrustable learners, and a set of narratives including case vignettes.

Defining EPAs is the first step. Next steps involve curricular change – defining how, when and where in the curriculum each EPA should be learned. A key feature to be developed by each medical school would be the assessment of each EPA and a critical corollary would be appropriate remediation. After developing a final draft of the CEPAER document in 2014, the AAMC will test the core EPAs through pilot programs at several institutions, in order to develop both appropriate curricula and assessments (C Aschenbrener, personal communication).

Professionalism, communication skills and dealing with uncertainty are threads that run through each of these EPAs. Thus innovations in medical education potentially could result in a smoother transition from undergraduate to graduate medical education. As noted above, these EPAs incorporate many concepts similar to previously defined UK GMC domains.[18]

Interprofessional education

The LCME is now focusing on the importance of interprofessional education (IPE). In 2013, it approved standard ED-19-A: 'The core curriculum of a medical education program must prepare medical students to function collaboratively on health care teams that include other health professionals. Members of the health care teams from other health professions may be either students or practitioners.'[20] This new LCME standard offers the opportunity to build on existing IPE to develop comparable interprofessional curricula across all US medical schools.

Interprofessional education is not a new concept. Over ten years ago the Institute of Medicine (IOM) published *To Err is Human*, which recommended that interprofessional training include specific knowledge, skills and attitudes (KSAs) necessary for successful teamwork.[21] These KSAs would require that a team member be able to identify and address errors when they occur.[22] The IOM recommended that recertification of health care professionals should require knowledge of patient safety practices such as functioning effectively in an interprofessional team. A successful example of interprofessional training is certification from the American Heart Association in advanced cardiovascular life support (ACLS). The training includes the importance of team roles, behaviours of effective team leaders and team members, and elements of effective resuscitation team dynamics.[23]

The recent report of the Interprofessional Education Collaborative defines the goal of interprofessional learning as preparing 'all health professions students for deliberatively working together with the common goal of building a safer and better patient-centered and community/ population oriented US health care system.'[24] Four competency domains are defined: (1) values and ethics for interprofessional practice, (2) roles and responsibilities, (3) interprofessional communication and (4) teams and teamwork. There are variations in the pedagogy of IPE, especially since IPE may occur in many settings, such as a shared classroom experience, a shared clinical experience or community services. Just as UME pedagogies are moving toward more active, clinically integrated, competency-based learning, similar approaches are being used with IPE.[3] For example, Western University of Health Sciences has an IPE program that includes asynchronous, community-based approaches to interprofessional learning.[25]

Published LCME data indicate that a majority of medical education programs (75%) include required interprofessional activities, and additional recent data demonstrate interprofessional teams now manage patients in increasing numbers of community settings.[22,24] Although there are wide variations in the definition and implementation of IPE, the LCME requirement will ensure comparability of IPE experiences.

Newer learning methodologies and learning communities

At the same time that the assessment of the learner is evolving, education itself is becoming more learner-centred and focused on active learning. The learning environment is moving from large classrooms with rote memorisation assessed by multiple-choice examinations, to small group settings, ie individual interactions in a facilitated setting or self-directed learning, assessed by multimodal means including peer feedback, reflective writing, and other forms of written examination. There is a renewed emphasis on longitudinal clinical experiences, including longitudinal integrated clerkships, and a recent successful example of a longitudinal, integrated curriculum for the entire third clinical year.[26–28] The importance of electronic health records training in UME is highlighted by several recent articles.[29,30] These new approaches allow the learner to focus on critical reasoning, problem solving and dealing with uncertainty. Learning these newer methodologies paves the way for learners to take individual paths to programme completion using a competency-based curriculum and to develop a process of lifelong learning. Eventually, progression through UME may be determined by assessment of competency rather than by the period of time elapsed, so that learners could proceed at their own pace through undergraduate medical education.

The 'flipped classroom' is receiving renewed emphasis in medical education.[31,32] Salman Khan recently described a model for this that leverages the benefits of computer technology and asynchronous learning.[33] In this model, structured lessons are presented for learning outside the classroom, rather than being presented in class. For example, a series of short videos online might be available to give the opportunity for learners to master the content. These lessons would provide the foundational knowledge for further work and problem-solving to be performed in the classroom in collaboration with peers and guided by teachers. In subsequent classroom sessions, students would engage with their teacher in problem-solving exercises. This allows for a degree of self-directed learning. Unpublished data from Stanford (K Ransohoff and J Zie, personal communication) suggest students favour this instruction, with 82% of 141 respondents preferring this model of instruction to a primarily lecture-based format. A recently proposed structure for medical education incorporates this model into three key components: (1) identification of minimal foundational material, (2) science-based interactive, compelling and patient-centered exercises and (3) personalised 'deeper dives.'[33]

Approaches such as problem-based learning and team-based learning (TBL) build on this 'flipped classroom' model and focus on small group participation. They are consistent with the LCME accreditation standards, which call for teaching strategies that develop the learner's ability to 'use principles and skills wisely in solving problems of health and disease.'[20,34] Briefly, team-based learning is a three-step process of (1) pre-class preparation, (2) assurance of readiness to apply learned concepts, and (3) application of content through group problem-solving activities. Initial data suggest that TBL enhances mastery of course content, particularly for students in the lowest academic quartile.[35] In addition, these approaches to learning can be used to address ACGME competencies, such as communication and professionalism, competencies that are best taught in a small group, case-based setting.

In the last few years, there has been increasing recognition of the significant cost of medical education and the necessity for innovation to address limited resources both in medical education and beyond.[36] Potentially cost-saving changes might include (1) curricular materials developed nationally and shared, (2) increased reliance on simulation, (3) standardised patient experiences and (4) education that is competency-based rather than time-based, allowing some students to graduate earlier.[37] A recent initiative from the American Medical Association (AMA), Accelerating Change in Medical Education, has funded a consortium of 11 institutions to align educational outcomes with the changing needs of our health care system, ie to alter undergraduate medical education significantly through bold, rigorously evaluated innovations that align medical student training with the evolving needs of patients, communities and the rapidly changing health care environment.[38] The intention is to develop learner-centred, competency based curricula using pre-determined measurable competencies.

In addition, the AAMC and the National Board of Medical Examiners (NBME) are developing the eFolio Connector, a shared infrastructure than will enable students and physicians to track and view their educational and professional data.[39] The eFolio will allow life-long tracking of education for learners across the educational continuum from UME to GME and CME.

Learning communities

Medical education spans much more than classroom content. It includes role modelling, peer learning, activities outside of the classroom and the 'hidden curriculum'. Learning communities (LCs) are stepping into this gap in structured medical education. Much has been written about the 'hidden curriculum', identifying worrisome medical student characteristics including depression, burn-out, and decreasing empathy.[40–43] Although ways to successfully address these problems have not been definitively demonstrated, LCs may be a first step. LCs, defined as 'an intentionally created group of students and/or faculty who are actively engaged in learning from each other',[44] have the potential to facilitate longitudinal relationships between faculty and students with a primary focus of learner well-being.

LCs were discussed decades ago as a 'collegiate way of living' in the undergraduate program at Harvard, with the aim of bridging traditional classroom education with the informal learning that happens among students. This concept was further developed by the University of Missouri-Kansas City and spread to 18 US and Canadian medical schools by 2006.[44,45] A recent survey identified 66/151 AAMC schools with LCs, with the majority having been set up since 2007.[46] Another 29 schools are actively considering creating LCs. However, there is a wide variation in emphasis, organisational structure, staffing and budget for activities. The major emphases have been identified as mentoring (89.3%), advising (71.4%), curriculum (60.7%), social (51.8%), and community service (33.9%). The organisational structures also vary widely, both in number of LCs per AAMC school and their labelling, with various names including 'societies',

'colleges' as well as 'learning communities'. The resources for LCs range from $10,000 to $1.4 million. The authors point out that the opportunity for role modelling and a 'safe space' within LCs for students to communicate strengthens their humanistic values and allows them to share a strong sense of professionalism with their faculty. Therefore, LCs do appear to address some of the 'hidden curriculum'. In the survey of LCs cited above, participants cited benefits of increased structure for advising and mentoring, community service, competitions, social activities and reflection.[46] Of interest, an institute of LCs, including many of these medical schools, has recently been formed: Learning Communities Institute, Inc (http://sites.tufts.edu/lci).

Conclusion

This review outlines both innovative advances and challenges facing medical education in the US in the twenty-first century. Innovative pedagogy will take the learner outside of the lecture hall and into small group facilitated sessions. These sessions will lay the groundwork for developing critical reasoning and problem-solving skills through interactive learning methods such as team-based learning and collaborative functioning on health care teams that include other health professionals. LCs support professional development through structured opportunities for advising and mentoring, community service and self-reflection. Finally, measurable competencies, EPAs have been outlined for learners to demonstrate that they are prepared for the responsibilities of residency at the completion of UME. The new educational environment addresses both individual patient and population health, with the potential for increasing shared decision-making and patient satisfaction. These innovations in medical education have the potential to finally address the IHI triple aim and improve the US health care system. ■

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