Calls for Reform of Medical Education by the Carnegie Foundation for the Advancement of Teaching: 1910 and 2010

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Abstract

The Carnegie Foundation for the Advancement of Teaching, which in 1910 helped stimulate the transformation of North American medical education with the publication of the Flexner Report, has a venerated place in the history of American medical education. Within a decade following Flexner's report, a strong scientifically oriented and rigorous form of medical education became well established; its structures and processes have changed relatively little since. However, the forces of change are again challenging medical education, and new calls for reform are emerging. In 2010, the Carnegie Foundation will issue another report, *Educating Physicians: A Call for Reform of Medical School and Residency*, that calls for (1) standardizing learning outcomes and individualizing the learning process, (2) promoting multiple forms of integration, (3) incorporating habits of inquiry and improvement, and (4) focusing on the progressive formation of the physician's professional identity. The authors, who wrote the 2010 Carnegie report, trace the seeds of these themes in Flexner's work and describe their own conceptions of them, addressing the prior and current challenges to medical education as well as recommendations for achieving excellence. The authors hope that the new report will generate the same excitement about educational innovation and reform of undergraduate and graduate medical education as the Flexner Report did a century ago.

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At the beginning of the 20th century, the Carnegie Foundation for the Advancement of Teaching spearheaded a major reform movement in medical education. The movement was guided by Abraham Flexner's vision—a vision in which scientific rigor and educational excellence were the driving forces in the preparation of physicians. Now, at the beginning of the 21st century, the Carnegie Foundation for the Advancement of Teaching is again calling for reforms that will improve the preparation of physicians. These two calls for change address remarkably similar themes but come out of distinctly different historical contexts and result in quite different recommendations. In this article, we trace four common themes across the two studies: (1) standardization of learning outcomes and individualization of the learning process, (2) integration of formal knowledge and clinical experience, (3) development of habits of inquiry and improvement, and (4) formation of professional identity. We argue that the Flexner model, which served medical education well for much of the 20th century, must be transformed to promote excellence in medical education for the 21st century.

We also describe the historical contexts of the two Carnegie studies of medical education in 1910 and 2010, their main themes, key recommendations, and their policy proposals to implement the recommendations.

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Precursors to the Call for Reform in 1910

Precursors of Flexner's study of medical education were conducted by the Association of American Medical Colleges (AAMC) in a few of its member schools in 1904 and by the American Medical Association's (AMA's) Council on Medical Education in all medical schools in 1906 and 1907. Under the leadership of Dr. N.P. Colwell, the AMA national survey, which used as its standard the most rigorous university models of Johns Hopkins University School of Medicine, Harvard Medical School, and others, revealed that many medical schools were deeply unsatisfactory. However, the AMA was in a delicate position of not wanting to condemn its own members, and it therefore sought the assistance of the Carnegie Foundation for the Advancement of Teaching, an impartial third party to conduct a comprehensive study of medical education in North America. In 1908, Dr. Henry Pritchett, inaugural president of the foundation, hired Abraham Flexner, not a physician but the former headmaster of a private high school in Louisville, Kentucky, to conduct the study.[1]

Before embarking on his site visits, Flexner went to Johns Hopkins, where his brother Simon had studied medicine. After speaking with faculty members there, he adopted the Johns Hopkins model as his exemplar of excellence. As he stated, "Without this pattern in the back of my mind, I could have accomplished little. With it I began a swift tour of medical schools in the United States and Canada."[2(p115)] During his site visits to all 155 medical schools in the United States and Canada in 1909, Flexner came to the same conclusion as Dr. Colwell: There were a number of excellent university-

based programs and many poor-quality for-profit medical schools. Flexner wrote, "Dr. Colwell and I made many trips together, but, whereas he was under the necessity of proceeding cautiously and tactfully, I was fortunately in position to tell the truth with utmost frankness," which he did indeed do.[2(p115)]

Flexner's 1910 Report on Medical Education

Flexner's 1910 report, *Medical Education in the United States and Canada*: *A Report to the Carnegie Foundation for the Advancement of Teaching*,[3] contains two parts: a year-by-year description of the proper medical school curriculum and the resources required to support it, and brief reports on each medical school he visited. Table 1 lists four themes emphasized in the Flexner Report and outlines the key problems that were addressed and the reforms recommended, which we summarize below.

Lack of standardization

Medical education in North America in the late 19th century was an ineffectual educational process, lacking rigorous academic standards and often carried out by local practitioners supplementing their clinical incomes. Schools were small and typically owned by the doctors, who operated them for a profit. Admission standards were minimal, typically a high school education, and all graduated regardless of the level of academic achievement. These findings fueled Flexner's recommendation to emulate the best university programs and insist on a strong, scientifically based undergraduate education prior to admittance to medical school.

Another of Flexner's recommendations addressed the great variability in curriculum among medical schools and the heterogeneity in student preparation and achievement. To better prepare students for the scientific approach to medical education, he advocated a set of science courses and a baccalaureate degree as prerequisites to matriculation into medical school. Flexner further supported the adoption of a rigorous four-year curriculum offered by the high-quality elite university medical schools and the elimination of the 16 weeks of lectures that were repeated once, which were common among the small, poor-quality proprietary medical schools. In those proprietary schools, there were rarely any laboratories or clinical experiences; students only infrequently examined a patient during their training. The curriculum was based on the received wisdom and practices of physicians, and there was no connection between practice and advances in science.[1] By contrast, Flexner advised widespread adoption of a medical curriculum consisting of two years of basic science followed by two years of clinical experience in a teaching hospital.

Because there were neither accepted academic standards nor an accrediting agency, many medical schools were of very poor quality. And, without licensing requirements, there was little way for the public to know if medical students were competent on graduation.

Lack of integration

As Flexner observed, most medical schools relied on lectures, repeated once, to transmit the information that students needed to learn to become doctors. He contended that this passive form of learning was ineffective if it was not connected to practice and argued that knowledge needed to be applied through more active forms of laboratory and clinical experience. By expanding laboratory and supervised clinical experience, Flexner believed that students

Table 1
Flexner's Recommendations for Educating Physicians in1910*

	Flexner Report of 1910	
Theme	**Challenges**	**Recommendations**
Standardization	• Lack of standard, rigorous curricula	• Insist on four years of college and a set of specific science courses as a prerequisite to medical studies
	• Poorly prepared students	• Create a standardized four-year curriculum in 2 + 2 design
	• Heterogeneity in student achievement	• Establish accreditation process for medical schools
Integration	• Limited science and laboratory experience in the curriculum	• Incorporate laboratory learning into the curriculum and connect advances in the laboratory with clinical practice at the bedside
	• Limited or no interaction with patients and therefore minimal opportunity to apply knowledge from lectures to patient care	• Expand the curriculum by two years and provide clinical training in university teaching hospitals
Habits of inquiry and improvement	• Excessive emphasis on rote memorization rather than on learning-by-doing in the laboratory and hospital	• Train physicians to "think like scientists" using scientific inquiry and research to solve clinical problems
	• Tradition-bound rather than scientifically oriented curriculum and faculty	• Require medical education to be taught by scientifically trained faculty members within university classroom and clinical settings
Identity formation	• Teaching by unqualified faculty members	• Immerse medical education in university culture
	• Role modeling by variably competent physicians in many proprietary and for-profit schools	• Facilitate close and sustained contact between learners and scientifically based faculty role models

* Source: Flexner A. Medical Education in the United States and Canada: A Report to the Carnegie Foundation for the Advancement of Teaching. Bulletin No. 4. Boston, Mass: Updyke; 1910.

would integrate scientific knowledge and inquiry into the care of their patients. This integration was deemed essential to the formation of scientifically oriented physicians.

The shift to experimental medicine from a focus on received wisdom fundamentally changed medical education. The establishment of medical laboratories and the creation of university teaching hospitals made it possible to incorporate an active learning process into medical education that encouraged the application and use of knowledge to solve clinical problems.[1]

Lack of inquiry

Flexner, like his predecessors, found that medical education within small, proprietary schools was bereft of scientific investigation and a rigorous academic culture and relied on rote memorization of the received wisdom of practicing physicians. Yet change was already occurring in the latter part of the 19th century, influenced by the rise of research laboratories in German universities, where the mechanisms of disease were being experimentally examined and confirmed. Many American physicians were excited about this experimentalist approach to medicine and traveled to Germany to learn laboratory research methods, returning with a commitment to establish scientific medicine at their universities, which included Chicago, Cornell, Harvard, Michigan, Pennsylvania, and, later, Johns Hopkins. Flexner expected that high-quality medical education would prepare students to emulate their scientifically oriented teachers, testing their formal knowledge against what they observed at the bedside and refining their understandings on the basis of their experience.

Flexner saw the inculcation of scientific curiosity and methods of investigation, as opposed to relying on rote memorization, as critical to medical education. Physicians should be taught to think like scientists—to use inquiry and research to advance the practice of medicine. To develop these habits of mind, medical students needed to be educated to approach problems through inquiry—as advocated by John Dewey and other progressive educators. Drawing a parallel between research and practice, Flexner[4(p4,6)] observed that

> no distinction can be made between research and practice. The investigator, obviously, observes, experiments, and judges; so do the physician and surgeon who practice their art in the modern spirit. At bottom the intellectual attitude and processes of the two are—or should be—identical. . . . If this position is sound, the ward and the laboratory are logically, from the standpoints of investigation, treatment, and education, inextricably intertwined.

As a result, Flexner recommended that medical education should be located within university classrooms and teaching hospitals, where discovery and the advancement of knowledge are central to its mission.

Failure to focus on professional identity formation

In a lecture-dominated curriculum with limited or no clinical experiences, students had few opportunities to observe the professional demeanor or actions of practitioners and thus had no role models to emulate. Later, as more laboratories and clinical experiences were introduced, there was still no formal focus on the development of professional identity. Flexner believed that students would absorb the values and behaviors of the faculty if they spent adequate time with them and learned the practice at their sides. Thus, student formation would best be served by immersion in university culture and sustained contact with scientifically grounded, university faculty role models.

In short, Flexner proposed the following standard features of a four-year education leading to the MD degree:

- Admission to medical school based on a bachelor's degree with a strong science background.
- A university-based medical school providing two years of basic science instruction in laboratories and classrooms, and two years of clinical experience in a teaching hospital.
- Instruction by physician–scientists who engage in teaching, research, and patient care, bringing the benefits of the laboratory to the bedside.
- Experience with investigation through supervised participation in laboratories and university-based teaching hospitals.

Applying the standards derived from Johns Hopkins, Flexner identified a number of schools that did not measure up, predominantly small proprietary schools that had inadequate instruction, substandard facilities, unscientific faculty members, and poorly prepared students.

Response to Flexner's Call for Reform

The impact of Flexner's report, taken very seriously by the medical education community, was amplified by muckraking journalists, who had a field day with Flexner's caustic judgments about specific schools. Within a decade, approximately one third of the 155 medical schools had closed or merged with other schools. Unfortunately, a number of the schools that closed were the only ones that offered women and African Americans access to medical education, a situation that was not rectified until the 1970s.

By 1920, all of the basic structures for standardization of medical education were firmly established. The AMA and the AAMC separately surveyed and evaluated medical schools (until 1942, when they combined their efforts and formed the Liaison Committee on Medical Education), the National Board of Medical Examiners (NBME) established the United States Medical Licensing Examinations, and state medical boards began to license practicing physicians.

The Flexner Report propelled Abraham Flexner to national prominence and a new position as the secretary of the General Education Board of the John D. Rockefeller Foundation. By directing substantial amounts of philanthropic funds to medical schools, he was able to upgrade standards and direct the course of the schools' educational programs.[5] As a result of all of these efforts, the scientifically oriented, university-based medical school and teaching hospital became the norm by the start of World War I. According to Ludmerer,[5] this was the first major transformation in American medical education and is often referred to as the "Flexnerian revolution."

Precursors to the Call for Reform in 2010

From World War I to World War II, the education mission was paramount and the Flexnerian model of integrating patient care and teaching was widespread. Patient care, investigation, and teaching were all connected because research was based in large part on careful observations of patients as well as patient-oriented investigative work in the laboratory.[6] Over the subsequent decades, two additional revolutions in academic medicine occurred: the revolution in biomedical research and the transformation of clinical practice into megabusiness. Each of these encouraged the ascendancy of a different medical school mission.

After World War II, the first of these revolutions took place, the rise of biomedical research. This occurred as a result of two forces: the rapid expansion of the National Institutes of Health and the incorporation of medical schools into universities; together, these resulted in an intensifying culture of "publish or perish." As research became increasingly molecular in nature, laboratory-based faculty found it more and more difficult to continue teaching and seeing patients; similarly, clinical teachers were unable to conduct leading-edge wet lab research. Thus, Flexner's ideal of the clinician–investigator who went back and forth from the laboratory to the bedside began to fade.

The other revolution, the transformation of clinical practice into megabusiness, began in 1965 with the passage of Medicare and Medicaid. Medical faculties expanded dramatically, and the primary income for medical schools became clinical practice revenue generated by the faculty. Over succeeding decades, the clinical productivity demands on the faculty increased and continued to do so, compressing or even eliminating time for teaching.[5] Today, medical students are being taught primarily by residents in the context of acutely ill patients on inpatient services where patients and staff change frequently and there is little continuity between the key participants in patient care. As a result, medical education faces a new set of challenges unimagined by Flexner. His recommendations have served medical education well but are strained to the limit by contemporary challenges in the practice of medicine and medical education.

The Contemporary Carnegie Study of Medical Education

A new model is needed that builds on the old but offers a new vision for curriculum, pedagogy, and assessment. Fortunately, that vision is beginning to take shape in innovations currently occurring in both undergraduate and graduate medical education. As Flexner's did, our work as scholars at the Carnegie Foundation for the Advancement of Teaching acknowledges the many innovations we have observed in the course of our two years of field work at selected U.S. medical schools and teaching hospitals; in addition, we are the beneficiaries of a body of theoretical and empirical work in medical education and the learning sciences.

As we reflect on medical education in the United States at the beginning of the 21st century, we find, like our famous forbearer, that it is lacking. Medical training is inflexible, overly long, and not learner-centered. Clinical education for both students and residents excessively emphasizes mastery of facts, inpatient clinical experience, teaching by residents, supervision by clinical faculty who have less and less time to teach, and hospitals with marginal capacity or willingness to support the teaching mission. We observed poor connections between formal knowledge and experiential learning and inadequate attention to patient populations, health care delivery, patient safety, and quality improvement. Learners lack a holistic view of patient experience and poorly understand the broader civic and advocacy roles of physicians. Finally, the pace and commercial nature of health care often impede the inculcation of fundamental values of the profession.

Our study is part of a larger body of work on preparation for the professions commissioned by the foundation. The companion studies, published as books, address the education of clergy,[7] lawyers,[8] engineers,[9] and nurses.[10] Our study will be published this year. All of these studies were initiated by then-Carnegie President Lee Shulman and guided by Carnegie senior scholars Anne Colby and William Sullivan. We received institutional review board approval from the Carnegie Foundation for the Advancement of Teaching and the University of California, San Francisco. Our project was funded by a grant from the Atlantic Philanthropies.

We studied 11 medical schools and three nonuniversity teaching hospitals* in the United States in 2005 and 2006. In contrast to Flexner, our purpose was not to evaluate educational programs at these institutions but, rather, to learn from their innovations and challenges. Each medical school and teaching hospital was selected for interesting educational innovations as well as to achieve diversity in terms of geographical representation and institutional type (e.g., research-intensive and community-based medical schools; academic health centers and nonuniversity teaching hospitals). We did not begin the project with a unitary or ideal model in mind as Flexner had done 100 years earlier. Rather, we were aware of and investigated interesting educational innovations at medical schools and residency programs nationally and considered their impact in framing our recommendations.

Most of our site visits lasted three days and included interviews, focus groups with students, residents, clerkship directors, and residency program directors, and observations of clinical teaching. Before each site visit, we conducted telephone interviews with educational leaders, including selected clerkship directors, residency program directors, department chairs, the dean of the medical school, the education-related associate deans, and the CEO of the teaching hospital.

In addition to the site visits, we reviewed the literature from medical education and the learning sciences to guide the analysis of our data and to provide a foundation for our recommendations. Before, during, and after the site visits, we consulted widely with the AAMC, the AMA, the NBME, the Society of Directors of Research in Medical Education, and other medical professions organizations, convened an expert panel to review our

* Atlantic Health; Cambridge Health Alliance; Henry Ford Hospital and Medical Center; Mayo Clinic Medical School; Northwestern University; Southern Illinois University; University of California, San Francisco; University of Florida; University of Minnesota; University of North Dakota; University of Pennsylvania; University of South Florida; University of Texas Medical Branch; and University of Washington.

preliminary observations, and incorporated the extensive and rigorous peer reviews of the drafts of each chapter of the book, *Educating Physicians: A Call for Reform of Medical School and Residency*,[11] that presents our findings.

Key Findings and Recommendations

We envision a medical education system that

- maximizes flexibility in the process of achieving standardized outcomes,
- creates opportunities for integrative and collaborative learning,
- inculcates habits of inquiry and improvement, and
- provides a supportive learning environment for the professional formation of students and residents—while at the same time it
- advances the health of patients and patient populations.

Table 2 summarizes our key findings associated with four themes:

- Standardize learning outcomes and individualize the learning process.
- Integrate formal learning with clinical experience.
- Develop habits of inquiry and improvement into medical education at all levels.
- Focus on the progressive formation of professional identity.

We briefly discuss these themes below.

Standardization and individualization

Medical education has historically standardized accreditation standards on the length and structure of the curriculum—for example, two years of basic science instruction followed by two years of clinical experience, and three or more years of residency training. Like many others, we argue that medical education should standardize learning outcomes and general competencies and then provide greater options for individualizing the learning experience for students and residents. By specifying and assessing competencies, high standards can be achieved while affording greater flexibility in the learning process and shortening the overly long educational process for those who can achieve competence early.

Individualization acknowledges that students and residents arrive with diverse backgrounds, experiences, and expertise. Yet, when students begin medical school, the knowledge and experience they bring with them are often disregarded. Their commitment to improving the quality of life of others and their interest in using science to do so are important sources of motivation. Our contention is that we can offer students and residents more opportunities to both learn medicine and also pursue areas of special interest, creating a richer educational experience and producing a more broadly trained physician as a result. This model assumes that some students and residents will achieve mastery sooner than others and should be allowed to pursue topics of interest in extra depth or to proceed more rapidly to the next stage of training. We believe that medical education would be more engaging and challenging if it focused on learners as whole persons with a variety of interests, motivations, knowledge, skills, learning preferences, and capabilities. We recommend the following related to standardization and individualization:

- Establish rigorous and progressively higher levels of competency across the trajectory of medical education and assess multiple domains in many settings using a variety of measures so that students can progress at their own pace.
- Individualize learning within and across levels, allowing flexibility in approaches to learning and the opportunity to progress as students achieve competency milestones.
- Offer elective programs around areas of interest and opportunities for students and residents to work with researchers and innovators in such areas as public health and advocacy, global health, medical education, clinical and translational research, and molecular medicine.

Integration of formal learning with clinical experience

We use the word *integration* to refer to the integration of formal knowledge of the basic, clinical, and social sciences with clinical experience in a much more balanced manner than is true today. This means that medical students should be provided early clinical immersion and residents should have more intense exposure to the sciences and best evidence underlying their practices. Integration also includes using that knowledge and experience to understand patients, their experiences, and their care more holistically. Finally, in a sense of the word that is broader than Flexner's concept, we see *integration* as learners taking on the multiple professional roles and commitments associated with being a physician. Because physicians perform a variety of roles, such as educator, advocate, innovator, investigator, and administrator, students and residents should integrate those additional roles into their professional aptitudes, goals, identities, and educational experiences. This includes developing the skills to provide effective team care in a complex health care system.

We envision an educational process that more adequately represents the integrated nature of physicians' learning and work. This means providing earlier opportunities for students to spend time with patients and families, physicians, and other health care professionals in real clinical settings. Such experiences can cultivate a rich foundation on which students can build formal knowledge, understand patient experiences and the contributions of different parts of the health care system, and start to conceptualize the multifaceted roles of physicians. Likewise, more advanced learners need time away from direct clinical responsibilities so that they can engage substantially in other physician activities, including management of the delivery of health care services, quality improvement initiatives, community work, advocacy, or activities within their professional organizations, as their interests take them. We make the following recommendations related to integration:

- Connect formal knowledge to clinical experience, including early clinical immersion and adequate opportunities for more advanced learners to reflect and study.
- Integrate basic, clinical, and social sciences.
- Engage learners at all levels with a more comprehensive perspective on patients' experience of illness and care, including

Table 2

Contemporary Challenges and Recommendations Identified by the Carnegie Foundation for the Advancement of Teaching in 2010*

	The Carnegie Report of 2010	
Theme	**Challenges**	**Recommendations**
Standardization and individualization	• Medical education is:	• Standardize learning outcomes through assessment of competencies
	o Not outcomes based	• Individualize learning process, allow opportunity to progress within and across levels when competencies are achieved
	o Inflexible	• Offer elective programs to support the development of skills for inquiry and improvement
	o Overly long	
	o Not learner-centered	
Integration	• Poor connections between formal knowledge and experiential learning	• Connect formal knowledge to clinical experience, including early clinical immersion and adequate opportunities for more advanced learners to reflect and study
	• Fragmented understanding of patient experience	• Integrate basic, clinical, and social sciences
	• Poorly understood nonclinical and civic roles of physicians	• Engage learners at all levels with a more comprehensive perspective on patients' experience of illness and care, including more longitudinal connections with patients
	• Inadequate attention to the skills required for effective team care in a complex health care system	• Provide opportunities for learners to experience the broader professional roles of physicians
		• Incorporate interprofessional education and teamwork in the curriculum
Habits of inquiry and improvement	• Focused on mastering today's skills and knowledge without also promoting knowledge-building and an enduring commitment to excellence	• Prepare learners to attain both routine and adaptive forms of expertise
	• Limited and often pro forma engagement in scientific inquiry and improvement exercises	• Engage learners in challenging problems and allow them to participate authentically in inquiry, innovation, and improvement of care
	• Inadequate attention to patient populations, health promotion, and practice-based learning and improvement	• Engage learners in initiatives focused on population health, quality improvement, and patient safety
	• Insufficient opportunity to participate in the management and improvement of the health care systems within which they learn and work	• Locate clinical education in settings where quality patient care is delivered, not just in university teaching hospitals
Identity formation	• Lack of clarity and focus on professional values	• Provide formal ethics instruction, storytelling, and symbols (honor codes, pledges, and white coat ceremonies)
	• Failure to assess, acknowledge, and advance professional behaviors	• Address the underlying messages expressed in the hidden curriculum and strive to align the espoused and enacted values of the clinical environment
	• Inadequate expectations for progressively higher levels of professional commitments	• Offer feedback, reflective opportunities, and assessment on professionalism, in the context of longitudinal mentoring and advising
	• Erosion of professional values because of pace and commercial nature of health care	• Promote relationships with faculty who simultaneously support learners and hold them to high standards
		• Create collaborative learning environments committed to excellence and continuous improvement

* Source: Cooke M, Irby DM, O'Brien BC. Educating Physicians: A Call for Reform of Medical School and Residency. San Francisco, Calif: Jossey-Bass–Carnegie Foundation for the Advancement of Teaching. In press.

more longitudinal connections with patients.

- Provide opportunities for learners to experience the broader professional roles of physicians, including educator, advocate, leader, and investigator.
- Incorporate interprofessional education and teamwork in the curriculum.

Habits of inquiry and improvement

To promote excellence throughout a lifetime of practice, physicians-in-training should be engaged in inquiry, discovery, and innovation. Insistence on excellence involves developing the habits of mind and heart that continually advance the practice of medicine and the health of the public.

Throughout the continuum of medical education, students, residents, and practicing clinicians need to devise and implement changes that will increase the effectiveness of practice and improve care for their patients. We suggest that training for inquiry and improvement requires moving beyond routine expertise to stretch the capabilities of the learner. The key to preventing "tapering off" or complacency in practice seems to be investing the effort needed to explore and address difficult or ambiguous problems. Research suggests that the habits of mind that foster inquiry and improvement must be developed alongside the development of routine expertise rather than after it.[12] Those who approach their work with adaptability stretch their knowledge even in routine situations. The implications of this for curriculum reform might be to explicitly teach about adaptive expertise and its acquisition and to challenge learners with new or unfamiliar problems or circumstances that require adaptation or reconfiguration of prior knowledge and skills to develop new strategies and solutions. An example we saw frequently in our field work was the participation of students and residents in quality improvement projects.

To develop habits of inquiry and improvement, we recommend the following:

- Prepare learners to attain both routine and adaptive forms of expertise.
- Engage learners in challenging problems, and allow them to participate authentically in inquiry, innovation, and improvement of care.
- Engage learners in initiatives focused on population health, quality improvement, and patient safety.
- Locate clinical education in settings where quality patient care is delivered, not just in university teaching hospitals.

Formation of professional identity

Medical education goes beyond learning medicine; it is fundamentally about becoming a dedicated physician. Therefore, the professional identity formation of physicians—meaning the development of their professional values, actions, and aspirations—should be a major focus of medical education. Formation of the professional identity of the physician includes the integration of our other three themes.

Formation, a term borrowed from our colleagues in the study of clergy,[7] involves the process of becoming a professional through expanding one's knowledge, understanding, and skillful performance; through engagement with other members of the profession, particularly more experienced others; and by deepening one's commitment to the values and dispositions of the profession into habits of the mind and heart.

Arnold and Stern[13] suggest that one's development as a medical professional has two elements. The first is demonstrating mastery in three foundational areas—clinical knowledge and competence in medicine, communication skills, and understanding the ethical and legal responsibilities of a physician. In addition to these foundational areas, there are aspirations: goals that are striven for but never achieved, as one can always improve. These include excellence, humanism, accountability, and altruism. We concur with this conceptualization of medical professionalism and suggest the following for the advancement of professional identity formation:

- Provide formal ethics instruction, storytelling, and symbols (honor codes, pledges, and white coat ceremonies).
- Address the underlying messages expressed in the hidden curriculum and strive to align the espoused and enacted values of the clinical environment.
- Offer feedback on, reflective opportunities for, and assessment of professionalism, in the context of longitudinal mentoring and advising.
- Promote relationships with faculty members who simultaneously support learners and hold them to high standards.
- Create collaborative learning environments committed to excellence and continuous improvement.

Discussion

While physicians and learners of medicine still require intelligence, industry, compassion, integrity, and fidelity as they did in Flexner's day, and while we argue that the themes of individualization and standardization, integration, habits of inquiry and improvement, and professional formation as a physician are continuous from Flexner's work to ours, sweeping changes in the practice of medicine have radically transformed what physicians must know and be capable of doing today. At the same time, insights from the learning sciences help us recognize that many features of contemporary undergraduate and graduate medical education do not support the development of the capacities we desire and society needs in our physicians. Some of these features are themselves Flexnerian legacies: for example, the 2 + 2 curricular structure; others, such as the ever-shortening periods of engagement between learners and their patients and between learners and their teachers, are the consequence of post-Flexnerian changes in the practice of medicine.

Achieving the changes we envision will require the concerted and combined efforts of faculty members in medical schools and teaching hospitals, program directors, department chairs, and deans as well as leaders of medical professions organizations and government. Each of our recommendations necessitates, or at a minimum would be facilitated by, changes at the state or national level in the financing, regulation, certification, and accreditation of medical education. For medical schools and residency programs to successfully innovate, the funders, regulators, and professional organizations that control or influence medical education must be actively engaged in this reform effort.

We propose that medical education's key stakeholders take the following seven major steps to advance U.S. medical education and, ultimately, the health of the public:

1. The AAMC and medical schools work together to revise premedical course requirements and admission criteria and processes.
2. Accrediting, certifying, and licensing bodies together develop a coherent framework for the continuum of medical education and establish effective mechanisms to coordinate standards and resolve jurisdictional conflicts.
3. CEOs of teaching hospitals and directors of residency programs align

patient care and clinical education to improve both and to develop educational programs that are consistent with practice requirements.

4. Deans of medical schools and CEOs of teaching hospitals support the teaching mission of the faculty by providing financial support, mentoring, faculty development, recognition, and academic advancement.
5. Deans of medical schools and CEOs of teaching hospitals collaboratively make funding for medical education transparent, fair, and aligned with the missions of both medical schools and teaching hospitals.
6. The AAMC, AMA, Accreditation Council for Graduate Medical Education (ACGME), medical specialty societies, and medical schools be advocates for sustained private, federal, and state funding commitments to support infrastructure, innovation, and research in medical education.
7. The AAMC, AMA, ACGME, medical specialty societies, and medical schools collaborate on the development of a medical workforce policy for the United States. This effort should result in a variety of interventions addressing the cost of medical education, length of training, and practice viability that will ensure that the country has the mix of specialty and subspecialty physicians to meet the needs of the population.

These action items, if implemented, would stimulate educational innovation, strengthen the preparation of physicians, and advance the health of the public.

A Call to Transform Medical Education

Given the decision 100 years ago of the Carnegie Foundation for the Advancement of Teaching to bring Flexner's fresh eyes to the enterprise of North American medical education, and given his commitment to advancing the health of the public by insisting on the best medical education the times had to offer, we believe that Abraham Flexner would welcome the foundation's new critique, undertaken in his spirit. In particular, we hope that the publication of the 2010 report[11] will generate the same excitement about educational innovation and reform of undergraduate and graduate medical education as the Flexner Report did a century ago. But if the report's four themes (standardization and individualization, integration, insistence on excellence, and focus on identity formation) and their accompanying recommendations are to be fulfilled, we must transform medical education yet again. We invite our colleagues to join us in creatively envisioning and thoughtfully inventing medical education anew.

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