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REVIEW ARTICLE

MEDICAL EDUCATION

Malcolm Cox, M.D., and David M. Irby, Ph.D., Editors

American Medical Education 100 Years after the Flexner Report

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MEDICAL EDUCATION SEEMS TO BE IN A PERPETUAL STATE OF UNREST. From the early 1900s to the present, more than a score of reports from foundations, educational bodies, and professional task forces have criticized medical education for emphasizing scientific knowledge over biologic understanding, clinical reasoning, practical skill, and the development of character, compassion, and integrity.[1-4] How did this situation arise, and what can be done about it? In this article, which introduces a new series on medical education in the *Journal*, we summarize the changes in medical education over the past century and describe the current challenges, using as a framework the key goals of professional education: to transmit knowledge, to impart skills, and to inculcate the values of the profession.

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ABRAHAM FLEXNER AND AMERICAN MEDICAL EDUCATION

Almost a century ago, Abraham Flexner, a research scholar at the Carnegie Foundation for the Advancement of Teaching, undertook an assessment of medical education in North America, visiting all 155 medical schools then in operation in the United States and Canada. His 1910 report, addressed primarily to the public, helped change the face of American medical education.[5-7] The power of Flexner's report derived from his emphasis on the scientific basis of medical practice, the comprehensive nature of his survey, and the appeal of his message to the American public. Although reform in medical education was already under way, Flexner's report fueled change by criticizing the mediocre quality and profit motive of many schools and teachers, the inadequate curricula and facilities at a number of schools, and the nonscientific approach to preparation for the profession, which contrasted with the university-based system of medical education in Germany.

At the core of Flexner's view was the notion that formal analytic reasoning, the kind of thinking integral to the natural sciences, should hold pride of place in the intellectual training of physicians. This idea was pioneered at Harvard University, the University of Michigan, and the University of Pennsylvania in the 1880s but was most fully expressed in the educational program at Johns Hopkins University, which Flexner regarded as the ideal for medical education.[8] In addition to a scientific foundation for medical education, Flexner envisioned a clinical phase of education in academically oriented hospitals, where thoughtful clinicians would pursue research stimulated by the questions that arose in the course of patient care and teach their students to do the same. To Flexner, research was not an end in its own

Courtesy of the Carnegie Corporation of New York.

Abraham Flexner.

right; it was important because it led to better patient care and teaching. Indeed, he subscribed to the motto, "Think much; publish little."[9]

TRANSFORMATION OF MEDICINE IN THE 20TH CENTURY

The academic environment has been transformed since Flexner's day. In academic hospitals, research quickly outstripped teaching in importance, and a "publish or perish" culture emerged in American universities and medical schools. Research productivity became the metric by which faculty accomplishment was judged; teaching, caring for patients, and addressing broader public health issues were viewed as less important activities. Thus, today's subordination of teaching to research, as well as the narrow gaze of American medical education on biologic matters, represents a long-standing tradition.[8]

In addition to the shift in the importance of research relative to teaching and patient care, a transformation in the process of research on human disease has contributed to our current state of affairs. For the first half of the 20th century, a distinctive feature of American medical education was the integration of investigation with teaching and patient care. Teaching, clinical care, and investigation each served the others' purposes, because most research was based on the direct examination of patients. Gifted clinical investigators tended to be equally gifted as clinicians and clinical teachers. After 1960, however, as medical research became increasingly molecular in orientation, patients were bypassed in most cutting-edge investigations, and immersion in the laboratory became necessary for the most prestigious scientific projects. Clinical teachers found it increasingly difficult to be first-tier researchers, and fewer and fewer investigators could bring the depth of clinical knowledge and experience to teaching that they once had.[10]

The increasing turbulence of the health care environment in the past 20 years has generated a second set of conditions inimical to medical education as Flexner imagined it. Clinical teachers have been under intensifying pressure to increase their clinical productivity — that is, to generate revenues by providing care for paying patients.[11-13] As a result, they have less time available for teaching, often to their immense frustration. In addition, the harsh, commercial atmosphere of the marketplace has permeated many academic medical centers. Students hear institutional leaders speaking more about "throughput," "capture of market share," "units of service," and the financial "bottom line" than about the prevention and relief of suffering. Students learn from this culture that health care as a business may threaten medicine as a calling.

Thus we arrive at our current predicament: medical students and residents are often taught clinical medicine either by faculty who spend very limited time seeing patients and honing their clinical skills (and who regard the practice of medicine as a secondary activity in their careers) or by teachers who have little familiarity with modern biomedical science (and who see few, if any, academic rewards in leaving their busy practices to teach). In either case, many clinical teachers no longer exemplify Flexner's model of the clinician-investigator.

LEARNING MEDICINE AS PROFESSIONAL EDUCATION

All forms of professional education share the goal of readying students for accomplished and respon-

sible practice in service to others. Thus, professionals in training must master both abundant theory and large bodies of knowledge; the final test of their efforts, however, will be not what they know but what they do. The purpose of medical education is to transmit the knowledge, impart the skills, and inculcate the values of the profession in an appropriately balanced and integrated manner.[14,15] In the apprenticeship model of medical training that prevailed into the mid-19th century, student physicians encountered this knowledge and these skills and values as enacted by their teachers in the course of caring for patients. How are knowledge, skills, and professional values represented in contemporary medical education?

The way in which students encounter the knowledge base of medicine has been profoundly influenced, as Flexner intended, by the assimilation of medical education into the culture of the university. Theoretical, scientific knowledge formulated in context-free and value-neutral terms is seen as the primary basis for medical knowledge and reasoning. This knowledge is grounded in the basic sciences; the academy accommodates less comfortably the practical skills and distinct moral orientation required for successful practice in medicine. However, Flexner had not intended that such knowledge should be the sole or even the predominant basis for clinical decision making.[5] Within 15 years after issuing his report, Flexner had come to believe that the medical curriculum overweighted the scientific aspects of medicine to the exclusion of the social and humanistic aspects. He wrote in 1925, "Scientific medicine in America — young, vigorous and positivistic — is today sadly deficient in cultural and philosophic background."[16] He undoubtedly would be disappointed to see the extent to which this critique still holds true.

Responsibility for the care of patients is a powerful stimulus for learning,[17] and active learning requires that clinical skills, both cognitive and procedural, be attained through the supervised provision of patient care. As Flexner recognized, medical novices require the opportunity to practice skills under the guidance of experienced teaching physicians until they attain a high level of proficiency. Increasing attention to the quality of care, patient safety, and documentation of care enhances medical practice[18] but threatens to relegate trainees to the role of passive observer. Given that every patient deserves the best possible care, we are challenged to provide appropriate opportunities for experiential learning and practice while meeting the service demands of teaching hospitals. The educational mission of teaching hospitals is further compromised by the absence of performance standards and assessment methods that can clearly establish that learners are ready to advance to the next level of independence and challenge.

The moral dimension of medical education requires that students and residents acquire a crucial set of professional values and qualities, at the heart of which is the willingness to put the needs of the patient first. A generation ago, the hours worked served as a simple proxy for dedication to patients; now, an appropriate concern for the well-being of trainees and the safety of their patients demands a new understanding of what it means to be dedicated to one's patients.[19] Professional values are continuously exemplified and enacted in the course of medical education through role modeling, setting expectations, telling stories and parables, and interacting with the health care environment, not just in courses on ethics and patient–doctor communication. However, the values of the profession are becoming increasingly difficult for learners to discern; the conclusions they draw, as they witness the struggle of underinsured working people to obtain health care, marked differences in the use of expensive technologies in different health care environments, and their physician-teachers in complicated relationships with companies that make health care products, should concern us.

Not only has the knowledge base for medical practice hypertrophied since Flexner's day, but the delivery of care has also become vastly more complicated, and the expectations of the public higher. However, it has been difficult to integrate the new skills, knowledge, and attitudes required for proficient practice into medical education at both the predoctoral and residency levels. Although many students and residents are interested in learning about interprofessional teamwork, population health, and health policy and the organization of health services, these topics tend to be poorly represented in medical school and residency curricula. It can be hard to teach messy real-world issues, but practitioners need to understand how these issues affect their patients and how to interact with, and ultimately improve, an

exceedingly complex and fragmented system to provide good patient care.

PREPARING PHYSICIANS FOR THE 21ST CENTURY

What can be done to bring the knowledge, skills, and values that must be imparted by medical education into better balance and to prepare outstanding physicians for the 21st century? As the articles in this series will illustrate, the solutions are apparent for some problems, but medical schools and the institutions that sponsor residency programs need to develop the will to implement them. Other problems are more complex, and their solutions more uncertain. With respect to medical knowledge, the gaps between what we know about how people learn and how medicine is currently taught can be corrected. Cognitive psychology has demonstrated that facts and concepts are best recalled and put into service when they are taught, practiced, and assessed in the context in which they will be used.[20] Several decades of research on clinical expertise have elucidated the thinking of physicians as they evaluate signs and symptoms, select and interpret diagnostic tests, and synthesize data to develop clinical assessments and care plans; these insights can be shared with learners as well as their teachers.[21]

The acquisition of skills for practice requires radical transformation. Although the dictum "see one, do one, teach one" may have characterized the way in which clinical skills were learned in the past, it is now clear that for training in skills to be effective, learners at all levels must have the opportunity to compare their performance with a standard and to practice until an acceptable level of proficiency is attained. An appreciation of the importance of practice and the honest admission that neophytes cannot perform high-stakes procedures at an acceptable level of proficiency demand that we develop approaches to skills training that do not put our patients at risk in service to education. The use of increasingly sophisticated simulations and virtual reality offers physicians at all levels the opportunity to refresh skills and learn new ones in a safe practice environment. Educational methods that allow the demonstration of mastery at one level, with respect to both technique and judgment, before progression to the next level teach an important lesson in professionalism as well.

The groundwork that has been laid by explicit instruction in professionalism, combined with effective role modeling and attention to the hidden curriculum of the practice environment, can support the development of a comprehensive and sophisticated understanding of professional education.[22] Sociologists have noted the importance of socialization and implicit learning in the development of professional attitudes and behaviors.[23]

It has long been observed that assessment drives learning. If we care whether medical students and residents become skillful practitioners and sensitive and compassionate healers, as well as knowledgeable technicians, our approaches to the evaluation of learners must reach beyond knowledge to rigorously assess procedural skills, judgment, and commitment to patients. Self-assessment, peer evaluations, portfolios of the learner's work, written assessments of clinical reasoning, standardized patient examinations, oral examinations, and sophisticated simulations are used increasingly to support the acquisition of appropriate professional values as well as knowledge, reasoning, and skills. Rigorous assessment has the potential to inspire learning, influence values, reinforce competence, and reassure the public.[24]

Much of what we know about effective interventions is not translated from research settings into everyday patient care. Increasing emphasis is being placed on evidence-based practice, systems approaches, and quality improvement. Advances in these areas require the ability to integrate scientific discoveries and context-specific experimentation for the continuous improvement of the processes of medical practice. New paradigms that connect these processes are emerging, and they have the potential to revolutionize both the way in which people learn and the environment in which learning takes place.[25]

FINDING THE WILL TO CHANGE

The need for a fundamental redesign of the content of medical training is clear. In some instances, the road that needs to be taken is also clear — for example, more emphasis should be placed on the social, economic, and political aspects of health care delivery. However, curricular reform is never simple or easy, and "turf battles" are inevitable. The challenge is not defining the appropriate content but rather incorporating it into the curricu-

lum in a manner that emphasizes its importance relative to the traditional biomedical content and then finding and preparing faculty to teach this revised curriculum.[26-28]

Reform of the process of clinical education is even more challenging; however, both regulatory and voluntary efforts are under way.[29,30] Some schools are developing clerkships that no longer focus solely on departmental inpatient services but instead include interdisciplinary approaches to the teaching of inpatient and outpatient care.[31,32] Long-term preceptorships or apprenticeships are being reestablished to ensure adequate observation, supervision, and mentoring of trainees. Proposed reforms of residency education in both medicine and surgery include shortened core rotations and earlier specialty training.[33-35] But who will do the teaching? Early experiments to identify, celebrate, and support a cadre of outstanding clinician-teachers, side by side with the laboratory-scientists and physician-scientists who are academic medicine's first-class citizens, hold promise for developing the innovative programs and providing the attentive supervision, assessment, and mentoring that beginning physicians need.[36]

A final problem is the financing of medical education.[23,37-39] Good teaching, whether it is conducted in the classroom, clinic, or hospital, requires time. Innovative approaches to teaching, progressive skills instruction, multitiered assessment, and support of the development of professionalism all require teachers who have the time to observe, instruct, coach, and assess their students and who also have time for self-reflection and their own professional development. Although the educational mission is expensive, many medical schools already possess the funds to support teaching properly, if they choose to use the funds for this purpose.[40]

One hundred years ago, Flexner's critique of medical education converted an evolutionary change already under way in North American medical education into a revolution. Medicine and the sciences underpinning it have made equally transformative advances since Flexner's report, and once again, our approach to education is inadequate to meet the needs of medicine. Ossified curricular structures, a persistent focus on the factual minutiae of today's knowledge base, distracted and overcommitted teaching faculty, archaic assessment practices, and regulatory constraints abound. These challenges threaten the integrated acquisition of technical knowledge and contextual understanding, the appropriately supervised mastery of practical skills, and the internalization of essential values that together make for an informed, curious, compassionate, proficient, and moral physician.

No one would cheer more loudly for a change in medical education than Abraham Flexner. He recognized that medical education had to reconfigure itself in response to changing scientific, social, and economic circumstances in order to flourish from one generation to the next. The flexibility and freedom to change — indeed, the mandate to do so — were part of Flexner's essential message. He would undoubtedly support the fundamental restructuring of medical education needed today. Indeed, we suspect he would find it long overdue.

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