THE CARNEGIE FOUNDATION
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PREPARATION FOR
THE PROFESSIONS

EDUCATING PHYSICIANS

A Call for Reform of Medical School and Residency

Molly Cooke
David M. Irby
Bridget C. O'Brien

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Foreword by

Lee S. Shulman

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THE PREPARATION FOR THE PROFESSIONS SERIES

The Preparation for the Professions Series reports the results of The Carnegie Foundation for the Advancement of Teaching's Preparation for the Professions Program, a comparative study of professional education in medicine, nursing, law, engineering, and preparation of the clergy.

FOREWORD: ON THE SHOULDERS OF FLEXNER

"The present report on medical education forms the first of a series of papers on professional schools to be issued by the Carnegie Foundation." So wrote Henry S. Pritchett, the first president of The Carnegie Foundation for the Advancement of Teaching, on April 16, 1910, in the opening sentence of his introduction to Abraham Flexner's now-famous Bulletin Number Four, *Medical Education in the United States and Canada*. Having served as Carnegie's eighth president, I now present my own Foreword to this new report on the education of physicians almost precisely one hundred years later. Whereas Flexner's report was among the first issued by the fledgling organization, the current report builds on more than a century of distinguished work, taking its place as the *last* in a series of studies of professional schools conducted by the Carnegie Foundation in recent years.

While Flexner's study of medical education opened a century of work on professional preparation, the present study closes a more recent loop, bringing to completion more than a decade of research on the education of lawyers, engineers, clergy, nurses, and physicians. During the same period, the foundation conducted research on the education of scholars through its studies of Ph.D. programs across a number of fields. In those studies, the doctorate was seen as preparation for a life of "professing" and thus parallel in many ways to other forms of professional preparation. With this body of work on professional education now complete, it seems fitting to look back on a century of research and reflection while also looking ahead to the volume you are about to read and its vision for the future.

On a more personal level, the present volume represents the keeping of a promise I made to Carnegie Foundation board members at my first meeting with them in early 1997. I explained that I admired the accomplishments of the foundation during its then ninety-two years of existence. Nevertheless, I expected that my efforts would be devoted in part to undoing the unintended consequences of some of the foundation's most successful historical contributions to the field of education—including the Flexner Report.

Looking back, it is clear that the foundation's many studies and recommendations created important solutions to major problems at the time. But what is also clear is that the very act of resolving one era's problems often contributed to the dilemmas of the next generation. This dynamic generally entailed transforming what was badly organized or even chaotic by establishing greater standardization and regulation. Thus, the Carnegie Unit addressed the pressing need for a clear distinction between secondary and higher education by setting new and higher standards for both graduation from high school and admission to colleges and universities. It did so by legitimizing a metric that defined the rigor of a secondary school education in terms of the length and intensity of each course that constituted its program. Unfortunately, in doing so it reified the value of "seat time" as a measure of academic rigor instead of looking to students' actual learning as the real gold standard.

A similar dynamic appears in the case of the Flexner Report, which addressed the problem of an utterly unregulated medical education dominated by schools of poor quality. Typically, that poor quality was a function of little or no teaching of modern science, poor prerequisites for admission and promotion, and far too few connections between serious academic work and carefully supervised clinical learning of medical practice in exemplary hospitals. The report was so hard-hitting in its critique and recommendations that within a few years many schools had closed. Flexner reports that, in the thirty years after the publication of his report, the number of American medical schools had been reduced from 155 to about 60 (Flexner, 1943, p. 113). That may be good news for the most part, but the reduction in size brought with it the demise of all but two of the medical schools that prepared black physicians and all but one that devoted its attention to preparing women for medical careers. Ultimately, the "Flexner curriculum" became a problem in itself, one that the authors of the present report address in their work.

Abraham Flexner developed a very special relationship with Henry Pritchett. Although they had never met before that auspicious day in 1908 when Pritchett invited Mr. Flexner to conduct the study of medical education, they subsequently became lifelong friends. So close was their friendship, and so trusting the bond, that upon Pritchett's death in August 1939, his widow asked Flexner to prepare his biography. In that biography, Flexner describes that initial meeting.

> On the basis of a small book, which I had written on the subject of the American College and which Pritchett liked, I was fortunate enough to be chosen by Pritchett in 1908 to make the study of medical

> education in America, subsequently in Europe. At our first interview, he asked me whether I would be willing to study the subject.
>
> I answered, "I am not a physician; aren't you confusing me with my brother Simon at the Rockefeller Institute for Medical Research?"
>
> "No," rejoined Pritchett. "I know your brother well. What I have in mind is not a medical study, but an educational one. Medical schools are schools and must be judged as such. For that, a very sketchy notion of the main functions of the various departments suffices. That you or any other intelligent layman can readily acquire. Such a study as I have in mind takes that for granted. Henceforth, these institutions must be viewed from the standpoint of education. Are they so equipped and conducted as to be able to train students to be efficient physicians, surgeons, and so on?" (Flexner 1943, pp. 108–109)

In his directive to Flexner, Pritchett thus defined the character of Carnegie Foundation studies for the next century. They were not to be studies by insiders for insiders. They were to be conducted by nonspecialists (or, as became more frequently the case, by a combination of specialists and nonspecialists) and addressed to a larger audience than that within the profession alone. Moreover, it would not be sufficient for the study to be conducted by convening a panel of widely admired sages and tapping their acquired wisdom. Instead, Flexner described the process as *ambulando discimus,* "we learn by going about." In this spirit, he engaged in two years of travel, observation, interview, interrogation, espionage, deliberation, and advisement; he learned, in short, by "going about," personally visiting every one of the 155 medical schools in the country. In so doing, he revolutionized our conception of the special report and policy analysis.

I do not, it should be said, use the term "espionage" gratuitously. In one case, Flexner describes the challenge of adequately inspecting the facilities of an osteopathic medical school in Des Moines because, as he toured the facility "in company with its dean, every door was locked and the janitor, who had possession of the keys, could not be found." There were signs on the doors that labeled the locked rooms as "laboratories," "histology," "anatomy," and the like. After getting rid of the dean at the railroad station, Flexner made a stealthy return to the school, finding the missing janitor and using a five-dollar bill to induce him to open every room. The signs on the doors not withstanding, the rooms turned out to be quite empty of any evidence supporting their putative uses. Sometimes, it seems, we learn both by going around and by sneaking

around—though I am confident that the present research team had no need to employ such methods of investigation.

Among the legacies left by the Flexner Report—beyond its impact on medical education—is the field-based policy report. Instead of simply convening a panel of recognized experts to deliberate about an issue of educational policy, Flexner and Pritchett determined to learn by "going about," by moving out into the field to visit the places and people in question. That said, the report was in many ways already shaped before the first site visit. Flexner had determined that the template for judging all medical schools would be Johns Hopkins, with its academic rigor, its teaching hospitals, and the quality of its full-time faculty.

A further legacy of Flexner is the practice of educational evaluation conducted through the eyes of the legitimate outsider. Once the study was defined as an educational one, not only was Flexner legitimated as a judge, but, by the same standard, an exclusively insider's view was disqualified.

Like Flexner, our research team also accomplished much of its learning by going about. They visited medical schools across the country that were selected because we had reason to believe that they were already employing exemplary practices. We did not use any one of them as a model of the ideal program, as Flexner had used Johns Hopkins; rather, the team saw in the schools' varied practices a sort of collective vision of the possible. Thus, the recommendations in the later chapters are not pie-in-the-sky dreams but proposals for activities some version of which are already in place.

In this sense, *ambulando discimus* is not only an apt motto for an approach to the study of medical education but, ironically, also for the signature pedagogies employed by the field: the use of clinical rounds and rotations as the primary basis for physicians to learn medicine by "going around" with more experienced mentors as well as peers as they move from patient to patient, from bedside to bedside, from clinic to clinic, and from hospital to hospital. In this manner, novice physicians study multiple examples of illness and healing, work with diverse medical role models and teachers, and engage with a variety of forms of illness and disability. Like Flexner and his Carnegie successors one hundred years later, physicians learn by going round and round on rounds and rotations.

The themes that cut through the foundation's other recent studies of professional education appear vividly in this report as well. Indeed, we purposely designed the order of our studies to ensure that medicine came last in the sequence rather than first. Ever since Flexner, medicine has served as the "model profession," and most other professions and forms

of professional education have been interpreted through the lens of medicine. We began instead with legal education and proceeded through engineering and the clergy before we began our studies of nursing and medical education; the themes that emerged in that sequence pervaded each of the professional fields. In medical education, they included particular attention to the challenge of curricular integration, the essential tension between standardization of curriculum and individualization of instructional opportunities, and the critically central role of professional and personal identity in learning to become a physician.

The challenges of integration are ubiquitous in medical education. As fields mature, they tend to grow through division and multiplication rather than through synthesis and simplification. New domains are added, new topics are identified, and new specializations are added to the canon. For each addition, there must be a new course, a new rotation, and a new set of journals. Yet medical students are expected to learn all these domains and somehow to connect, combine, and integrate them within their own understandings and their own professional identities. Our team repeatedly identified the need for the medical curriculum and its programs to foster more of these integrations rather than leave the work entirely to the students.

Another needed kind of integration, easily as problematic as the intellectual and technical demands of the work, is a synthesis of the cognitive and the moral aspects of professional work. In every field we studied, we concluded that the most overlooked aspect of professional preparation was the formation of a professional identity with a moral and ethical core of service and responsibility around which the habits of mind and of practice could be organized. We first recognized the importance of professional identity in our studies of legal education and developed better language and examples of the process when we studied the education of clergy. Indeed, the very term *formation* is taken from religious education.

Yet, as soon as one recognizes the need for a coordinated curriculum aimed at deep understanding, complex technical competence, and deeply internalized moral responsibility, it becomes apparent that one size will not fit all. The authors of this report address with skill and sensitivity how the standardization of an integrated curriculum must be balanced by the affordances of individual adaptation. An integrated curriculum must provide the basis for the formation of individual professional integrity. This is no small challenge.

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Quite remarkably, Flexner operated as a solo practitioner. He visited the sites alone and he wrote his report alone, although it was read and critiqued carefully both by leaders of the medical profession and by Pritchett himself. In contrast to Flexner's solo performance, this new Carnegie Foundation study of medical education is an ensemble piece, drawing on multiple disciplines and backgrounds, and involving both insiders and outsiders. Chief among them, as co-leaders of the research program on the education of physicians, are Professor Molly Cooke and Professor David Irby of the University of California, San Francisco (UCSF).

Molly Cooke is a physician who holds the William G. Irwin Endowed Chair as professor of medicine at UCSF as well as serving as director of the Haile T. Debas Academy of Medical Educators at that institution. She has been a pioneer in the treatment of chronically ill HIV/AIDS patients. Her contributions to the teaching of medicine have been recognized through her selection in 2006 as winner of the Robert J. Glaser Award for Excellence in Clinical Teaching by the Association of American Medical Schools, one of the most prestigious national awards in the field of clinical teaching.

David Irby serves as vice dean for medical education at UCSF. He has long been a leader in research in medical education, having been recognized with major awards by both the National Board of Medical Examiners and the American Educational Research Association for his accomplishments in that field. Holding a doctorate in educational research, Irby brings both theoretical and methodological competence to this study that is, like Flexner's, a profoundly educational inquiry.

Bridget O'Brien joined the study team from the beginning as a graduate research assistant while completing her Ph.D. studies in higher education at the University of California, Berkeley. She rapidly became a full partner in the effort, and, when the research was completed, she joined Cooke and Irby on the faculty of UCSF.

As noted above, this study benefitted from being the last in the foundation's series of comparative investigations of education in the professions. Coming on the heels of our studies of legal education, engineering education, and the preparation of Catholic, Protestant, and Jewish clergy, and concurrent with a study on the preparation of nurses, the research drew on insights from other fields. Moreover, the study team regularly invited scholars from other research programs at the foundation to join in their site visits and to become fellow travelers as they learned by going about.

In that spirit, the fingerprints of William Sullivan and Anne Colby can be found on all parts of this work. Sullivan and Colby served as the

overall coordinators for each of the foundation's studies of professional preparation. Bill Sullivan is a philosopher whose career has included as much social science as it has philosophical analysis. He was part of the team that authored the landmark studies *Habits of the Heart* and *The Good Society*. The two editions of his book *Work and Integrity* lay out a conception of the moral foundations of professional work. He was senior author of the Carnegie Foundation's report on legal education, *Educating Lawyers*, and its book on undergraduate liberal education as preparation for practice, *A New Agenda for Higher Education*.

Anne Colby is a life-span developmental psychologist whose work on moral development and moral learning in children and adults has had great influence internationally. She is co-author of *The Measurement of Moral Judgment* with Lawrence Kohlberg, and her book with William Damon, *Some Do Care,* is a seminal study of adult moral development. More recently, she is co-author of *Educating Citizens* and *Educating for Democracy,* both books part of Carnegie's program on the role of universities in educating for civic and political engagement.

Thus, in place of Abraham Flexner working alone, a century later we have availed ourselves of the talents of an interdisciplinary team including physicians and medical educators, psychologists and philosophers, and scholars of higher education and of professional education. Nevertheless, the work was possible only because we were able to sit "on the shoulders of Flexner," to build our effort on his, whether viewed appreciatively or critically. And we could pursue the work in the context of a century-old research institution whose credibility rested in large measure on the accomplishments of Flexner and Pritchett.

Henry Pritchett dated his introduction to the Flexner Report on April 16, 1910, which was his fifty-third birthday. Perhaps he viewed the report as a kind of birthday gift from his good friend Mr. Flexner, for no publication before or since contributed more to Pritchett's dream of transforming the Carnegie Foundation from a pension fund into a "great agency" for improving education and teaching in all their dimensions. And what a birthday gift it became! Inspired by the quality of the study and the impact of this kind of field-based policy research aimed at the critical evaluation of educational quality, Mr. Carnegie instructed the leaders of the Carnegie Corporation of New York, his sole philanthropic institution, to add $1,250,000 to the endowment of The Carnegie Foundation for the Advancement of Teaching. In 2010 dollars, this is equivalent to more than $30,000,000 in additional resources for the foundation's work. But even more important, it signaled the formal transformation of the pension program into a world-class research and policy center in education.

Ambulando discimus remains the hallmark of the foundation's work. The gifted scholars who prepared *Educating Physicians* came to the work after "going about" the many fields of study they represent. They sought the advice of many others, both within and outside medicine, and they visited a broad array of institutions, observing and interviewing, surveying and reading. I believe that all those in the field of medical education must take the observations and recommendations of this book seriously and that its insights can be of value to educators outside of the field as well. I commend this fine work to your attention. It has commanded my attention for a number of years. I thank the team and all those who had a part in supporting this superb effort, as I also express my appreciation to Abraham Flexner, on whose shoulders they stand, and to Henry Pritchett, on whose broad shoulders I have been privileged to perch.

Lee S. Shulman, President Emeritus
The Carnegie Foundation for the Advancement of Teaching
Stanford, California

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THIS BOOK REPRESENTS more than four years of collaboration. Through fieldwork, generation of ideas, shared writing, and mutual critique, we developed an interdependent process; its product is thus truly a group effort. Accordingly, we list ourselves as authors alphabetically to emphasize that no one of us takes precedence. We hope our audience likewise recognizes and appreciates that in our work and the resulting book we were, and are, an indivisible team.

The team, however, had much by way of assistance, and we gratefully acknowledge the many people who have contributed to the project and book. First among them are the students, residents, faculty members, deans, and hospital CEOs who graciously hosted us; participated in our interviews and focus groups; and allowed us to observe their teaching, medical schools, and teaching hospitals: Atlantic Health; Cambridge Health Alliance; Northwestern University; Henry Ford Health System; Mayo Medical School; 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, Galveston; and University of Washington.

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David M. Irby, Ph.D. David M. Irby co-directed the Carnegie Foundation's Study of Medical Education. Irby is vice dean for education and a professor of medicine at the University of California, San Francisco, School of Medicine, where he directs undergraduate, graduate, and continuing medical education programs and heads the Office of Medical Education. He is the recipient of the Distinguished Scholar Award by the American Educational Research Association, the John P. Hubbard Award from the National Board of Medical Examiners, the Daniel C. Tosteson Award for Leadership in Medical Education from Harvard Medical School and Beth Israel Deaconess Medical Center, the Distinguished Service Award from Graceland University, and the John E. Chapman Medal Award from Vanderbilt University School of Medicine. He earned a doctorate in education from the University of Washington and a master's of divinity from Union Theological Seminary, and he completed a postdoctoral fellowship in academic administration at Harvard Medical School.

Bridget C. O'Brien, Ph.D. Bridget C. O'Brien was a co-equal participant in the Carnegie Foundation's Study of Medical Education,

contributing significantly to all aspects of the project, from framing the conceptual questions through the fieldwork and the writing. She is an assistant professor of medicine at the University of California, San Francisco, School of Medicine and a researcher in the Office of Medical Education. O'Brien conducts research on clinical education and teaches in the Health Professions Education Pathway and the Teaching Scholars Program at UCSF. She has a B.S. from Cornell University, a master's from the Haas School of Business at the University of California at Berkeley, and a doctorate from the Graduate School of Education at UC Berkeley.

INTRODUCTION

IN 1910, ABRAHAM FLEXNER articulated the current blueprint for medical education in North America. His report, *Medical Education in the United States and Canada*, is a comprehensive survey of medical education prepared on behalf of The Carnegie Foundation for the Advancement of Teaching and at the request of the American Medical Association's Council on Medical Education. The basic features outlined by Flexner remain in place today: a university-based education consisting of two years of basic sciences and two years of clinical experience in a teaching hospital. Implementation of that blueprint has brought medical education to a high level of excellence. Yet during the past century, along with enormous societal changes, the practice of medicine and its scientific, pharmacological, and technological foundations have been transformed. Now medical education in the United States is at a crossroads: those who teach medical students and residents must choose whether to continue in the direction established more than a hundred years ago or take a fundamentally different course, guided by contemporary innovation and new understanding about how people learn.

Can medical education's illustrious past serve as an adequate guide to a future of excellence? Flexner asserted that scientific inquiry and discovery, not past traditions and practices, should point the way to the future in both medicine and medical education. Today, this admonition seems even more compelling, given the rapid changes in the practice of medicine and an expanded understanding of human learning. New technologies and drugs are radically altering diagnostic and therapeutic options, and physicians are playing both broader and more specialized roles in an increasingly complex health care system. At the same time, changes in health care delivery, financing, and public policy are leaving millions of Americans without health care, and many health care institutions are gravely underfunded. New discoveries in the learning sciences and

changes in the preparation of physicians all argue for the need to reexamine medical education.

Responding to these environmental forces and changes within medicine, virtually every organization within the medical profession is reexamining medical education. The American Medical Association, the Association of American Medical Colleges, the Accreditation Council for Graduate Medical Education, the Accreditation Council for Continuing Medical Education, the Federation of State Medical Boards, the National Board of Medical Examiners, and many specialty boards that license medical specialists are all asking fundamental questions: How can we improve medical education? Can we produce competent and compassionate physicians more efficiently and effectively? How can we reorganize medical education to produce physicians who are able to achieve better health care outcomes for the American people?

It is within this context of self-assessment that, nearly one hundred years after Flexner's landmark study, we undertook an investigation of medical education as part of a larger study of education for the professions, sponsored by The Carnegie Foundation for the Advancement of Teaching. Flexner—his picture hanging prominently in the main room of The Carnegie Foundation for the Advancement of Teaching—became an icon and a companion during our study. As he did, we set out to examine the status of medical education and chart the course for future directions. Following in his large footsteps, we visited medical schools and academic health centers around the country.

Unlike our predecessor, however, we did not find great disparities in the quality of education among the medical schools we visited. Although we were highly selective in choosing which schools to include in our study, and although many of them excel in innovation, we recognize that two important external agents, accrediting and licensing systems.

Without question, medical education today is unlike the enterprise that Flexner investigated in 1909. Today U.S. medical education is characterized by a great deal of educational creativity and innovation. While he would easily understand the current paradigm of physician education as the one he helped to put in place, Flexner would hardly recognize the contemporary practice of medicine,. He would applaud the scientific basis of medicine and the progress that has been made in advancing health. However, he might wonder if the old structures of medical education can continue to support rising challenges, both internal and external, to medical education. As the challenges confronting medical education inevitably increase, a new vision is needed to drive medical education to the next level of excellence. The future demands new

approaches to shaping the minds, hands, and hearts of physicians. Fundamental change in medical education will require new curricula, new pedagogies, and new forms of assessment.

Fortunately, this vision is beginning to take shape. Seeds of the future are germinating in innovations in both undergraduate and graduate medical education. As Kenneth Ludmerer points out in *Time to Heal* (1999), the reforms that Flexner advocated were under way well before he issued his critique. Similarly, we observed many innovations in the course of our fieldwork and study of the literature on medical education and the learning sciences. For example, most medical schools have developed integrated coursework for the first two years of study; use web-based learning resources, simulations, and standardized patients for instruction and assessment; have clearly defined competencies and learning objectives; use small groups in a variety of teaching situations; and are guided by effective educational leadership. Likewise, residency programs are using simulation both in teaching and to assess performance; are beginning to take teamwork skills seriously; and are experimenting with using patient outcomes as an element of the assessment of residents.

However, as did Flexner in his time, we find medical education lacking in many important regards. Medical training is inflexible, excessively long, and not learner-centered. We found that clinical education is overly focused on inpatient clinical experience, supervised by clinical faculty who have less and less time to teach and who have ceded much of their teaching responsibilities to residents, and situated in hospitals with marginal capacity to support their teaching mission. We observed poor connections between formal knowledge and experiential learning and inadequate attention to patient populations, health care delivery, and effectiveness. Students lack a holistic view of patients and often poorly understand nonclinical physician roles. At both the undergraduate and graduate levels, there is insufficient attention to the knowledge and skills required to meet the health care needs of the U.S. population. Residents continue to be assigned to clinical settings on the basis of inpatient service imperatives rather than learner educational needs. Across the continuum, we observed that medical education does not adequately make use of the learning sciences. Finally, time and again we saw that the pace and commercial nature of health care impede inculcation of the fundamental values of the profession.

In response to our findings, we offer this book as a way to build on medical education's significant strengths, address its problems, and suggest a vision for the future.

The Study Behind the Book

Our study was part of a larger program of research on preparation for the professions, commissioned by The Carnegie Foundation for the Advancement of Teaching. The work was funded by a grant from the Atlantic Philanthropies, and this resulting book is a companion to reports on educating the clergy, lawyers, engineers, and nurses. (See Benner, Sutphen, Leonard, & Day, 2009; Foster, Dahill, Golemon, & Tolentino, 2005; Sheppard, Macatangay, Colby, & Sullivan, 2008; Sullivan, Colby, Wegner, Bond, & Shulman, 2007; see also Sullivan 2004; Sullivan & Rosin, 2008.) The program was initiated by Carnegie's then president, Lee Shulman, and guided by Carnegie senior scholars Anne Colby and William Sullivan.

Flexner went to all 155 of the medical schools in North America in 1909, and he pioneered the site visit as a research tool. After designing the study protocol and receiving approval from human subject review boards of the Carnegie Foundation and the University of California, San Francisco, we visited 11 of the 130 medical schools and teaching hospitals in the United States currently accredited by the Liaison Committee for Medical Education of the Association of American Medical Colleges and three nonuniversity teaching hospitals. (Osteopathic medical schools, which have somewhat different curricula, cost structures, and accreditation, were not included in the study.) Although each site was selected because of interesting educational innovations, we also wanted to survey medical education across institutional type and geographic location. The institutions thus represent the array of research-intensive and community-based medical schools, academic medical centers, and nonuniversity teaching hospitals where U.S. medical education is located:

- Atlantic Health, Morristown, New Jersey
- Cambridge Hospital, Cambridge, Massachusetts
- Henry Ford Hospital and Medical Center, Detroit, Michigan
- Mayo Medical School, Rochester, Minnesota
- Northwestern University, Chicago, Illinois
- Southern Illinois University, Springfield
- University of California, San Francisco
- University of Florida, Gainesville and Jacksonville
- University of Minnesota, Minneapolis
- University of North Dakota, Grand Forks
- University of Pennsylvania, Philadelphia

- University of South Florida, Tampa
- University of Texas Medical Branch, Galveston
- University of Washington, Seattle

Prior to each site visit, we interviewed approximately ten faculty members, the dean, the education-related associate deans, and the CEO of the teaching hospital. Most site visits lasted three days, included the authors plus other Carnegie scholars, and involved further interviews, focus groups with students, residents, clerkship directors, and residency program directors, and observations of clinical teaching. Over the course of our site visits, we conducted approximately 184 interviews, 104 focus groups, and 100 observations. The interviews and focus groups were transcribed and coded for common themes.

We also reviewed the literature on medical education and the learning sciences as a means of guiding interpretation of our results and our recommendations. Before, during, and after the site visits, we consulted widely with the leadership and staff of the Association of American Medical Colleges, the American Medical Association, the National Board of Medical Examiners, the Society of Directors of Research in Medical Education, and other medical professional organizations; we also convened an expert panel to review our preliminary observations.

In embarking on the study, we envied Flexner because he had a clear template for medical education in mind before he set out on his site visits: medical education should adopt the model recently created at Johns Hopkins. "Without this pattern in the back of my mind," Flexner wrote, "I could have accomplished little. With it I began a swift tour of medical schools in the United States and Canada" (1940, p. 115). We had no such pattern. However, as we conducted our site visits, read widely in the literature of medical education and the learning sciences, and began to share our insights with others, a new vision for the future of medical education emerged, the vision that we offer in this book.

Toward a Vision for the Future of Medical Education

The key findings of our study, which we detail in Chapter One, lead us to recommend four goals for medical education:

1. *Standardization of learning outcomes and individualization of the learning process*. Whereas the Flexner model (two years of basic science instruction followed by two years of clinical experience) has been rigorously maintained through the system of accreditation, medical education should now instead standardize learning outcomes and general competencies and then provide options for individualizing the

learning experience for students and residents, such as offering the possibility of fast tracking within and across levels.

2. *Integration of formal knowledge and clinical experience*. In practice physicians must constantly integrate all aspects of their knowledge and skills. Moreover, physicians educate, advocate, innovate, investigate, and manage teams. Students and residents need to understand and prepare for integration of these diverse roles, responsibilities, knowledge, and skills; their learning in the basic, clinical, and social sciences should be integrated with their clinical experiences. To experience integration of skills and knowledge in a way that prepares for them for practice, medical students should be given early clinical immersion, and residents should have more intense exposure to the sciences and best evidence underlying their practice.
3. *Development of habits of inquiry and innovation*. Commitment to excellence involves developing the habits of mind and heart that continuously advance medicine and health care; this applies to institutions as well as individuals. To help students and residents develop the habits of inquiry and improvement that promote excellence throughout a lifetime of practice, medical schools and teaching hospitals should support engagement of all physicians-in-training in inquiry, discovery, and innovation.
4. *Focus on professional identity formation*. Professional identity formation—development of professional values, actions, and aspirations—should be a major focus of medical education. It should build on an essential foundation of clinical competence, communication and interpersonal skills, and ethical and legal understanding, and extend to aspirational goals in performance excellence, accountability, humanism, and altruism.

These goals, which have their roots in Flexner's model of medical education, reflect many of the strengths of U.S. medical education, address its fault lines, and point to its future. Realizing such a future, however, will entail significant reform within and across programs. Advocacy must change the policies that affect the design and delivery of U.S. medical education.

Consider, for example, undergraduate medical education, the four years of medical school. The progressive and developmental nature of learning calls for greater longitudinal connections to be made among teachers, learners, and patients and across the four years of medical school. The situated and distributed nature of learning suggests the need for a stronger connection between clinical learning in specific

contexts and the formal knowledge basic to the practice of medicine. This would suggest the importance of promoting early clinical immersion and continuous connection of formal knowledge to clinical experience, which has consequences for curriculum, pedagogy, and assessment.

However, medical education exists within a web of organizational, financial, and regulatory relationships that both support and challenge educational excellence. The participatory aspect of medical education, for example—long a major strength of medical education at the undergraduate and graduate levels—is now being tested by the financial pressures on the clinical enterprise, which are marginalizing teaching and learning. Not only must new models for teaching and learning be developed but new approaches to financing clinical education will need to be found, entailing policy changes within institutions and in external funding and regulation. Thus, to achieve a new vision for medical education, each of medical education's stakeholder communities will have to work together to examine, strengthen, and align curriculum, pedagogy, assessment, accreditation, licensing, certification, and funding—all toward a common goal of excellence for both the education of aspiring physicians and the care of patients.

The Plan of the Book

The book begins with an overview of medical education and the profession of medicine, the focus of Part One. In Chapter One, we present the historical background and describe the current structure of medical education, including environmental trends and challenges. In Chapter Two we describe the core domains of the physician's work: caring for patients, participating in a professional community, and instigating improvement and inquiry. We review the research on learning that explains how physicians become adept at performing in each of these core domains, and we describe the process of professional formation.

In Part Two, we look at the experience of medical education, of learning to become a physician. In Chapter Three, we examine learning during medical school, and in Chapter Four we describe the experience of learning during residency training. In both chapters we focus on the design and experience of the curriculum, pedagogy, and assessment, looking at strengths and failings as well as promising innovations that build on the former and address the latter.

The complex environment for financing, regulating, and leading medical education is the focus of Part Three. Chapter Five examines the regulation and financing of medical education. Although these external

forces have historically inhibited educational innovation, we found that change is afoot in the medical schools and residency programs we visited, sparked by faculty vision, leadership, and creativity and, in some cases, supported by strong institutional leadership and facilitated by innovative uses of regulatory processes to spur change. In Chapter Six, we illustrate the principles of leadership with inspiring examples of transformational leadership we witnessed and learned about during our study.

We close the book with a vision of the possible. Part Four discusses the opportunities for advancing U.S. medical education. Such opportunities abound, and we offer our vision as a set of recommendations that we believe will make medical education the premier professional education in the world. In Chapter Seven, we offer examples of educational programs at the medical student and residency level intended to realize our principles of individualization, integration, inquiry, and improvement and give explicit attention to the formation of professional identity. Because significant reform of medical education will depend on structural changes and creation of a culture of transparency and accountability, we enumerate, in Chapter Eight, a set of recommendations for policy actions that would support medical education in reaching the goals of standardization and individualization, integration, habits of inquiry and improvement, and formation of professional identity. Only through policy changes can this vision for the future of medical education be fully realized.

Using This Book

It is our intention that this book stimulate discussion about the current status and future direction of medical education and advance health globally. We hope that students, residents, and practicing physicians will find that their concerns and hopes are voiced. Deans and associate deans for education, medical educators, and teaching faculty should find direction for curriculum development, pedagogy, and assessment. Educational researchers will find a theoretical base for new areas of scholarship in medical education. Policy bodies charged with accreditation, certification, and licensure will find recommendations for needed changes. Professional organizations will find guidance for future directions of the profession. Hospitals and funding agencies will hear a call for fundamental changes in financing medical education.

Most of all, however, we hope that this book results in much-needed dialogue within and among these groups—dialogue leading to action that strengthens medical education and thus, ultimately, delivers better patient care.

PART ONE

TODAY'S PRACTICE, YESTERDAY'S LEGACY, TOMORROW'S CHALLENGES

1

EDUCATING PHYSICIANS

CONTEXT AND CHALLENGES

CONTEMPORARY MEDICAL EDUCATION would be unrecognizable to physicians in nineteenth-century America. Preparation of doctors then was a relatively informal and unfettered affair: admission standards were lax, and in most instances only a high school education was required. The curriculum consisted of sixteen weeks of lectures, repeated for eight months of instruction. There was no patient contact or laboratory experience, and all matriculants graduated with an M.D. degree regardless of academic performance. Teachers were typically practicing physicians who gave instruction part-time as a means of supplementing their income (Ludmerer, 1985, 1999). Medical schools varied in both organization and quality, ranging from elite university programs to small for-profit enterprises. With no accreditation standards, many of these medical schools were of poor quality indeed. With no certification or licensing requirements, many practicing physicians were marginally competent, if at all. It was virtually impossible for members of the public to know if the medical care they received was quality or quackery.

The document that changed medical education and practice was the Flexner Report of 1910. Challenged by highly variable physician performance and the lack of standards in medical education, the American Medical Association's Council on Medical Education, under the leadership of Dr. N. P. Colwell, conducted a survey of medical schools and found many of them wanting. However, as a membership organization the AMA was in an awkward position if wholesale condemnation of medical education was required. Therefore, in 1908 the AMA sought the help of the newly formed Carnegie Foundation for the Advancement of Teaching to conduct a comprehensive study of medical education in North

America. Henry Pritchett, president of the foundation, commissioned not a physician but an educator, Abraham Flexner, to lead the study. The choice of a non-physician was astute; as Flexner later recalled, "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" (Flexner, 1940, p. 115).

By the time Flexner and Colwell visited all 155 medical schools in the United States and Canada in 1909 and issued his report in 1910, the basic framework of contemporary medical education was already taking shape. The transformation that shifted medical education to its current rigorous, science-based form began in the mid-nineteenth century with the rise of experimental medicine in German universities, where research laboratories empirically confirmed or disproved hypotheses about mechanisms of disease. This experimentalist approach challenged the established medical culture, in which both learning and practicing medicine were based on tradition and the works of ancient physicians. American physicians, attracted to Germany and laboratory research, returned from visits abroad imbued with this spirit of scientific medicine and determined to adopt the model for preparing physicians at their universities, which included Chicago, Cornell, Harvard, Michigan, Pennsylvania, and later Johns Hopkins, where the empirical approach to medicine achieved its zenith. Through the efforts of these reformers, medical education was brought into the university and medical laboratories were established along with teaching hospitals (Ludmerer, 1985).

In preparation for his site visits, Flexner visited Johns Hopkins, where his brother Simon had studied medicine before becoming the first director of the Rockefeller Institute for Medical Research. There he spoke to leading physicians who had strong opinions about what a medical school should be, having created one only twenty years earlier. Flexner adopted the Johns Hopkins model as his standard, comparing the schools that he visited to it.

During his site visits, Flexner encountered a number of excellent university-based programs of medical education that met his criteria. Flexner believed that medical practice must be firmly rooted in the foundation of science, not in superstition, speculation, and uncritical empiricism. He saw inculcation of scientific curiosity and methods of investigation as essential to medical education, drawing a parallel between research and practice: "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