Revisiting the Medical School Educational Mission at a Time of Expansion

Proceedings of a Conference
Chaired by Jordan J. Cohen, M.D.

Edited by Mary Hager and Sue Russell

JOSIAH MACY JR FOUNDATION

Revisiting the Medical School Educational Mission at a Time of Expansion

A Conference Sponsored by the Josiah Macy, Jr. Foundation

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Preface

George E. Thibault, M.D.

This conference was born out of discussions I had with a number of medical school and education leaders in the first two months of 2008, shortly after I became the President of Josiah Macy, Jr. Foundation. It was becoming apparent to these individuals that we were undergoing the first expansion in medical school education in this country in more than 30 years without any thoughtful or systematic discussion about what the goals and expectations of the expansion should be. This seemed to be a propitious moment to re-examine the educational mission of existing and new schools by asking how we could use the current efforts toward expansion to address new or unmet needs in education.

As we commissioned background papers and assembled the thoughtful and experienced participants for this conference, we defined some boundaries for our discussion. We did not want this discussion to be about physician shortage. Many knowledgeable people are debating the accuracy of the projections about an impending physician shortage, and we did not think we could make

our most significant contributions by adding to that debate. Rather, we wanted the group to address the question of how we should be educating physicians for the 21st century, regardless of the number we are going to produce. How can we take advantage of this moment of medical school expansion to improve and modernize the content and process of medical education to better serve the public good? This framing of the questions led to rich discussions about what the public needs for optimal healthcare, what changes need to take place in the healthcare delivery system, and what responsibility medical schools have to prepare physicians to better meet the public's needs and to participate most effectively in a changing healthcare system.

We identified many educational challenges facing medical schools today:

- How can they achieve a student body that is more diverse (racially, ethnically, socially, and geographically) to reflect the society it will serve?

- How can they reduce the burden of student debt so that it does not deter qualified students from entering the profession or adversely influence career choices?

- How can they truly integrate the teaching of science and clinical medicine to make science relevant in clinical practice throughout the medical school years and beyond?

- How can they use technology and educational theory to give the tools for meaningful lifelong learning to all of their graduates?

- How can they incorporate the principles of patient safety, quality improvement, public policy, and public health into the curriculum for all students?

- How can they make meaningful interprofessional education, collaboration, and teamwork a part of the medical school experience for all students?

- How can they create clinical training for students that is less fragmented and more representative of the experiences and clinical problems of the patients they will serve?

- How can they better integrate the whole continuum of education from premedical to continuing education?

- How can they influence student career choices to more closely match society's needs?

- How can they create an educational environment that models and encourages the professional attitudes and behaviors that we prize and that our society wants?

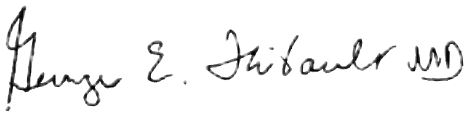
The papers and discussion included in this monograph provide the rationale for the conclusions and recommendations from the conference. I will not repeat them in these introductory remarks, but I would say in summary that these recommendations, taken together, make a strong case that this should be a time for innovation, educational experimentation, and cultural change in our medical schools. It was the sense of the group that there is a need for a better alignment of our medical schools' educational mission with the health needs of the public. Positive changes that have already occurred need to be publicized and championed, and further innovations need to be encouraged in the new and expanding schools. This time of expansion is a unique opportunity to promote needed change. It will be tragic if it resulted in "more of the same."

We now approach the 100th anniversary of the hallmark report of Abraham Flexner on medical school education in the United States and Canada. Flexner's ideas provide a relevant standard for current efforts toward expansion. Flexner did his survey of American medical schools at a time when most medical schools were proprietary institutions, there were no admissions requirements to medical schools, there were no full-time faculty, and there were no standards for curriculum. As a result of his report, standards for admission and curriculum were established for all medical schools, basic science became the underpinning for medical education, and a system of full-time faculty in clinical departments was established. We are still indebted to Flexner for the institutionalization of these changes, which have permanently changed medical education for the better. But the problems we face in medical education today are different from those faced by Flexner. The explosive growth in the science and technology related to medical practice, the dramatic changes that are occurring in the organization and financing of medical care,

and the changing demographics of the population we serve call for us to address a range of issues that were not part of the Flexnerian reform. As an educational reformer, Flexner would have understood this. I believe he would have applauded the recommendations from this Macy conference.

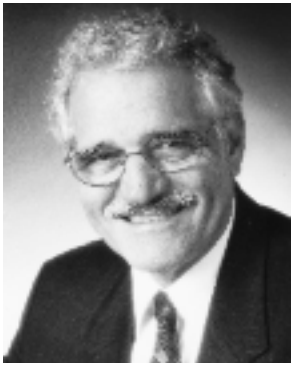
The recommendations are directed to all who have an influence on medical education: guidance counselors and admissions officers; faculties of medical schools; deans and administrators of academic medical centers; regulatory bodies; the federal government; and private foundations. It is our hope that all of these audiences will respond by participating in further discussions on these important issues. Accomplishing the recommended changes will require leadership from academic medicine and the support of government and private funders. The Macy Foundation is ready to participate actively in this process. At a time when there is a growing consensus about the need for change in the U.S. healthcare system, we believe that medical education reform is an essential part of enduring healthcare reform. Our existing and new medical schools are an invaluable national resource, and this is an unparalleled opportunity for them to take a leadership role.

I want to thank the authors of the papers and the participants in the conference for their enormous contributions to the quality of the discussions and the strength of the recommendations. Jordan Cohen was brilliant as a conference chair; there is no one I know of that has his breadth of experience and his skill to lead such a discussion. I also want to thank the Josiah Macy, Jr. Foundation staff, particularly Nicholas Romano, whose tireless efforts made this conference such a success.



President, Josiah Macy, Jr. Foundation

Introduction



Jordan J. Cohen, M.D.
Chairman

I think we'd all agree that, from time to time, it's a good idea for medical educators to step back and look critically at whether they're doing the best they can to meet their solemn responsibilities to their students and the public. Given the current push to expand medical school enrollment in an effort to close the physician workforce gap, now is clearly such a time. With academic leaders and elected officials across the country focused for the first time in over 30 years on ways to increase medical school capacity, a window of opportunity has opened for fresh thinking about both the content and processes of medical education. It would be tragic if we failed to seize this opportunity for improvement before the window closes.

We all know that medical education is not yet perfectly aligned with societal needs, as it must be if our students are to be prepared for the challenges they will face over the coming decades of their professional lives. Despite the many impressive innovations that educators have adopted since the Flexnerian revolution of 1910, our current system of medical education remains in too many ways

riveted to the needs of a bygone era. That era was dominated by acute, often self-limited disease; by a limited array of effective technologies; by manageable healthcare costs; by a misperception that healthcare was of uniformly high quality; by blithe ignorance about threats to patient safety; by widespread indifference to the paucity of minority representation among our students and faculty; and by a laissez-faire attitude about the specialty mix and geographic distribution of physicians.

To say the least, times have changed—and are continuing to change—at an ever-accelerating pace. To fulfill its critical social mission in these changing times, medical education must find ways to break away from outmoded approaches and adopt strategies to prepare physicians to meet the challenges ahead. The Josiah Macy, Jr. Foundation is convinced that this extraordinary period of expanding medical school enrollment can and should be harnessed to achieve this goal.

Chairman's Summary of the Conference

For the first time in 30 years, medical schools in the United States are expanding their enrollment in response to projected shortages in the country's physician workforce. The development of nine new allopathic medical schools is already underway with at least five more in planning stages. All but 18 of the 126 existing schools are increasing class size, some by adding new branch campuses. By 2020, allopathic medical schools are expected to graduate an additional 5000 physicians each year. Growth also is occurring among osteopathic schools. Since 2000, nine new osteopathic schools have been added to the 19 already in existence, and more are planned.

This period of expansion offers unparalleled opportunities not only to examine existing medical school curricula but also to explore bold, innovative ways to improve the education of a new generation of physicians. To assess the ways in which current expansion efforts might be harnessed to advance the effectiveness of medical education, the Josiah Macy, Jr. Foundation convened a conference entitled "Revisiting the Medical School Educational Mission at a Time of Expansion." The conference was held in Charleston, South Carolina, in October 2008. Jordan J. Cohen, M.D., President Emeritus of the Association of American Medical Colleges and currently Professor of Medicine and Public Health at George Washington University School of Medicine, served as chair.

For two and a half days, 35 participants, experts in both allopathic and osteopathic medical education, discussed the challenges and opportunities presented by the current efforts to address the need for more physicians. Their consensus conclusions and recommendations are included at the end of this brief summary.

Discussion and deliberations were assisted by five commissioned papers that reviewed the recent growth in both allopathic and

osteopathic medical school enrollments, identified shortcomings in the current system, gleaned lessons to be learned from past expansion efforts, and offered a framework for considering new models of medical education.

Medical education today is rooted in the landmark work of Abraham Flexner, whose 1910 critique led to a greatly revised model of medical education, the broad outlines of which are still in evidence. Indeed, many features of that model—notably its commitment to the scientific foundations of medicine and its insistence on uniformly high standards—remain as valid as ever. However, the enormous changes that have transformed medicine over the past century have outstripped the ability of the Flexnerian model to prepare future physicians adequately for the challenges and expectations of the new century.

This is not to suggest that medical education has remained static since Flexner's reforms were introduced. Far from it. Indeed, participants acknowledged the impressive number of innovations that medical educators have implemented, especially over the past few decades. For example, virtually all schools have made substantial revisions in their curricula, have incorporated small-group, problem-based modes of instruction, and have adopted novel methods for assessing clinical skills; many have introduced earlier and more extensive longitudinal clinical experiences. In addition, medical schools are rapidly adapting modern information technologies to develop novel pedagogical tools, including lecture casting, interactive Web-based instruction, and use of mobile devices to access all manner of helpful resources.

Despite these striking innovations, participants were unanimous in the view that medical educators should seize the current call for expanded enrollment as an opportunity to make substantial additional improvements. Although brand-new schools and new branch campuses of existing schools are arguably in the best position to introduce major innovations, participants agreed that all schools should take advantage of the renewed focus on the content and process of medical education to ensure optimal preparation of their students for the 21st century.

The overarching theme that coursed through the discussions was

the urgent desire to bring medical education into better alignment with societal needs and expectations. Hence, much of the discussion focused on contemporary realities that are not yet adequately reflected in the preparation of future physicians. Notable examples include the accelerating pace of scientific discovery; the determined calls for more public accountability; the unsustainable rise in healthcare costs; the well-documented shortfalls in healthcare quality; the unconscionable racial and ethnic disparities in health and healthcare; and the inexorable increase in the burden of chronic illness and disability.

Among the tasks identified for medical schools were the following: (a) re-define the science that is the foundation of medicine; (b) underscore the importance of problem solving and self-directed learning in an era of exploding knowledge; (c) ensure that students experience continuity of care for individual patients, especially those with chronic illnesses; (d) provide students with opportunities to learn the principles of quality improvement and patient safety; (e) place less emphasis on hospital venues and more on community settings as "classrooms" for educating future physicians; (f) prepare students to work effectively as members of inter-professional teams; (g) broaden the understanding of public health and non-biologic determinants of illness; (h) foster long-term relationships between students and faculty; and (i) develop the teaching and mentoring skills of faculty.

Participants also focused on several key "structural" features of medical education that were considered particularly nettlesome and in need of urgent remedy. One such issue is the growing level of medical student debt. More than 80 percent of medical students graduate with an educational debt that now averages over $130,000. In addition to the ethical imperative to relieve this burden, the "price tag" of medical school discourages college students of high potential but modest means from even considering a medical career. Similarly, the prospect of such a heavy debt load may discourage medical students from choosing less lucrative but potentially more socially responsible career paths.

A second, and related, structural issue addressed by participants is the persistent skew in the racial, economic, and geographic backgrounds of medical students, which continues to yield a physician workforce that is less representative of the society at large. Thus, there was

strong support for re-examining the medical school admissions process — with its heavy reliance on MCAT and test scores — in an effort to attract a broader range of potential students. The continued lack of adequate racial and ethnic diversity among medical students and faculty was a particular worry. Addressing this issue was judged essential for preparing the culturally competent physician workforce needed to care for the country's increasingly diverse population.

A third issue that greatly concerned participants was the conspicuous gap that exists between the rhetorical commitment to high professional standards and the actual behavior on display in many present-day learning environments. Medical students acquire their professional identities and norms of behavior not nearly as much from exhortations in the classroom as they do from observing how respected role models interact with patients, staff, and outside entities. Too often, what students observe serves to foster cynicism rather than to reinforce the avowed values of professionalism.

While the current wave of expansion offers great opportunities for advancing medical education by addressing these and other shortcomings, the barriers to making substantive changes are equally great. Participants singled out several such barriers that must be overcome. One striking example is the need to capture the attention and active participation of institutional leadership, without which meaningful change was deemed unlikely. This goal may be particularly challenging in settings where the rationale for expanding enrollment has more to do with local economic development or with gaining prestige for the institution than with meeting the public's need for a more effective physician workforce.

Also cited as a barrier is the perception that current accreditation standards for both undergraduate and graduate medical education are overly rigid. Although the validity of this perception was debated, it was seen nevertheless as inhibiting educators from considering changes that might deviate substantially from traditional practices. Current accreditation requirements were thought to be particularly problematic for implementing novel inter-professional educational programs. The development of such programs was viewed as increasingly desirable, given the widely acknowledged advantages of deploying inter-disciplinary teams in clinical practice, especially to care for patients with chronic illnesses.

The poorly coordinated transitions across the educational "continuum"—first from college to medical school, then to residency, and ultimately to practice—were seen to pose additional obstacles to innovations that might otherwise optimize learning and shorten the duration of formal education.

Fortunately, as reflected in the conclusions and recommendations below, there was no shortage of suggestions about how to address these barriers. While the recommendations are directed specifically at undergraduate medical education, participants were mindful that many also are salient for the graduate and postgraduate phases of medical education and, indeed, for the education of other health professionals as well.

Finally, participants expressed great confidence that thoughtful innovations in medical education stimulated by this era of expanded enrollment would, in the long term, yield measurable improvements in the quality of healthcare. Documenting the long-term outcomes of educational innovation is admittedly difficult, but efforts to do so should be mounted now so that the next wave of medical school expansion can take full advantage of the lessons learned today.

CONFERENCE CONCLUSIONS

Crisis in Healthcare

Healthcare in the United States is in trouble. More than sixty million people are uninsured or underinsured. Healthcare costs continue to escalate faster than the rate of GDP growth. Health outcomes, patient satisfaction, and quality indicators in the United States are all worse than those of most developed nations. Compounding these difficulties, unconscionable health disparities exist between poor and rich, uninsured and insured, and minority and majority populations.

The U.S. Physician Workforce

The United States is likely to face a significant shortfall in the number of physicians needed for the future. Although that shortfall is difficult to quantify,[i] it is abundantly clear that substantial qualitative changes

i The ongoing expansion of medical school capacity will not result in a larger physician workforce unless the number of residency positions also increases. Absent a parallel expansion of GME, increasing the number of U.S. medical school graduates will only serve to reduce the number of graduates of foreign medical schools who enter residency training in this country but will not increase the number of physicians entering practice in the United States.

are needed in medical education to better prepare future physicians for the challenges ahead. Among those changes are the expanded range of competencies that all physicians must have in order to meet the needs of a rapidly evolving healthcare system; the woeful lack of adequate racial and ethnic diversity in the physician workforce; and the persistent geographic and specialty maldistribution of physicians.

The State of Medical Education

Although medical educators have implemented countless curricular and pedagogical innovations over recent decades, medical education has not kept pace with the growing public expectations of physicians or with the novel demands of an increasingly complex healthcare system. As a consequence, medical students too often graduate without all of the knowledge and skills that 21st century physicians need and without fully appreciating the role that professional values and attitudes play in sustaining medicine as a moral enterprise. To address current shortcomings and achieve better alignment with societal needs and expectations, medical schools will need to modify both the content and the processes of their educational programs, and to give greater priority to the teaching mission of faculty. In addition, medical schools will need to take concerted actions to ensure that the learning environments in which students are immersed reflect the professional attributes espoused in the classroom. Medical students acquire their professional identity and standards of behavior largely as a consequence of the role models they encounter in the course of their education. Too often the lessons students learn from the powerful "hidden" or "informal" curriculum experienced in the course of their education not only fail to reinforce but also serve to undermine the school's expressed commitment to inculcating high standards of professional behavior.

Finally, attention must be given to the prevailing cultural norms that exist in far too many institutions, norms which can be aptly described as individualistic, autonomous, expert-centric, and hierarchical. Such cultural attributes are increasingly at odds with those known to be conducive to delivering high-quality healthcare: namely, collaborative, mutually accountable, patient- and community-centric, and outcomes focused.

This Moment in Time

The need for action is urgent and compelling. This time of expansion in medical school enrollment provides an unparalleled opportunity to re-examine longstanding assumptions in medical education and to encourage focused innovation that will better prepare students to meet the needs of the American people. Efforts to improve must span the continuum of medical education—from premedical education, through undergraduate, graduate, and continuing medical education—with careful attention to the transitions between those stages.

To accomplish this task, institutional leaders and governing bodies must become visibly and actively engaged in the improvement process. The assistance of federal and state governments, as well as private foundations will also be required.

This period of expansion in enrollment must not result in "more of the same." Failing to take full advantage of the opportunity afforded by this "natural experiment" to advance the mission of medical education for the benefit of the public would be tragic.

RECOMMENDATIONS

The expansion of medical school enrollment for the first time in more than 30 years provides an extraordinary opportunity for all schools to reassess their educational programs to assure that they are meeting the health needs of society. This opportunity is particularly propitious for new schools and those opening new two- or four-year branch campuses, but also should be seized by established schools, whether or not they are pursuing enrollment growth.

Regarding Institutional Leadership and Governance

— Medical school deans, as well as presidents and governing boards of parent institutions, have a clear role and responsibility in affecting needed changes and must exert strong leadership in facilitating, and participating in, the change process if the sought-for improvements in the institutional culture are to occur.

— In order to achieve the core educational mission of their institutions and meet the health needs of the public, institutional leaders and governing boards should comprise men and women from all racial and ethnic groups in American society.

Regarding the Core Mission of Medical Schools

— All medical schools have an obligation to educate future physicians who are prepared both to assess and to meet the health needs of the public. This obligation entails:

- ensuring that all medical students retain their enthusiasm for medicine and remain committed to its societal missions;
- fashioning educational experiences that enable all students, whether intending careers in practice, research or administration, to acquire the knowledge, skills, attitudes, and behaviors of true professionals;
- providing a physician workforce drawn from all sectors of American society;
- educating medical students who are prepared to choose careers as generalists and specialists in adequate numbers to address the full range of patient needs in all geographic regions of the country;
- fostering greater inter-professional teamwork and collaboration.

Regarding Medical School Admissions

— To ensure access to high-quality health services for everyone, medical schools must broaden the definition of merit in determining who is qualified for admission to the profession.

— Medical schools must reduce their reliance on standardized tests, college grade point averages, and traditional undergraduate course requirements in selecting applicants for admission. Although these factors can predict success during the first two years of the traditional medical school curriculum, they fail to assess the full range of attributes required of fully competent physicians. Medical schools must employ a more balanced, comprehensive set of admission criteria in order to attract, matriculate, and support students who, in addition to the requisite intellectual skills, have the maturity, judgment, and commitment to serving others required to meet public expectations and needs.

— Medical schools also must develop and utilize more effective methods than those currently employed to enlarge and diversify the pool of applicants for admission.

Regarding the Debt Burden of Medical Students

— Medical schools must find ways to substantially reduce the level of student debt. For example, schools should consider:

- making additional funds available (e.g., from endowments, alumni giving) for needs-based scholarships
- organizing the curriculum to allow students the option of meeting graduation requirements in three rather than four years
- advocating the creation of more state and federal programs that provide substantial debt forgiveness in return for a period of public service
- ensuring that all students receive appropriate counseling for minimizing and managing debt
- capping tuition at current or reduced levels

Regarding Innovations in Medical Education

— To address recognized shortcomings in traditional models of medical education, all medical schools should update their curricular content and implement, evaluate, and disseminate innovative pedagogical approaches that enhance student achievement of learning objectives.

— All medical schools should ensure that students become familiar with critical subject matter not yet incorporated sufficiently in the typical curriculum. Examples include:

- knowledge and skills for improving the quality of patient care and enhancing patient safety
- application of information sciences and systems thinking
- principles of public health and prevention
- role of non-biologic determinants of illness
- health implications of cultural diversity
- organization, financing, and performance of the healthcare system
- creation and impact of governmental health policy

— All medical schools should adopt promising pedagogical innovations to enrich the learning experience for students. Examples include:

  - underscoring the relevance of "basic science" topics by integrating preclinical and clinical education throughout the curriculum
  - employing novel models of clinical education that:
    - epitomize inter-professional, team-based care
    - incorporate extensive community as well as hospital-based experiences
    - enable longitudinal patient and faculty relationships
  - using computer- and mannequin-based simulations for education and assessment
  - applying e-learning and other information technologies to augment traditional methods of instruction and to develop skills for life-long, self-directed learning

Regarding Medical School Faculty

— Medical schools should recruit and support men and women faculty members who reflect the ethnic and racial diversity of the American population.

— Medical schools and their faculty must assure that all learning environments exemplify and nurture the development of positive professional values. To this end, faculty must:

  - embody and express consistently the professional values and competencies expected of medical students
  - engage in effective professional development activities

— Medical schools must assure that faculty are recognized and rewarded, financially and otherwise, for excellence in teaching, mentoring, and inter-professional activities, and that career pathways for medical educators are supported.

Regarding Standard-Setting Bodies

— The agencies responsible for accrediting allopathic and osteopathic medical education at both the undergraduate and graduate

levels should promote innovation across the continuum. The Liaison Committee on Medical Education (LCME), the Commission on Osteopathic College Accreditation (COCA), the Accreditation Council for Graduate Medical Education (ACGME), and the Council on Osteopathic Postdoctoral Training (COPT) should:

- begin promptly to share information with one another
- collaborate to assure maximal flexibility in designing and implementing accredited undergraduate and graduate education programs. This flexibility is particularly important for the LCME and COCA in fostering innovations in new-applicant schools and schools undergoing significant expansion
- foster team training and the efficient use of faculty and clinician resources across the professions
- develop methods to disseminate information about innovative programs

— Those responsible for high-stakes tests and evaluations (i.e., for admission, licensure, and certification) should make certain that their assessments are aligned with educational objectives throughout the continuum of education.

— The Association of American Medical Colleges (AAMC) and the American Association of Colleges of Osteopathic Medicine (AACOM) should accelerate their efforts to assess (a) the relevance of traditional course requirements for admission to medical school and (b) the elements of the MCAT examination and its role in the admission process.

Regarding Government and Private Entities

— The federal government should:

- greatly expand existing forms of national service for health professionals, especially the National Health Service Corps (NHSC), and develop additional programs of national service to help address societal needs
- recast the role of and increase the investment in Title VII to support innovations and research in health professions education
- authorize and support a collaborative body to assess the country's health workforce and recommend policies for meeting future health workforce needs

— Public and private entities should be encouraged to:

- provide funds to document and evaluate the outcomes of the current medical school expansion efforts
- fund a national center or institute to disseminate successful innovations and support research in health professions education

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I.

An Overview of Current Expansion Activities

A Potpourri of Issues

At the outset, participants identified a number of issues and challenges confronting medical education that they thought needed to be explored in their discussions. These included:

— How much do physicians need to know about public policy and management? Not understanding the context in which they work contributes in many ways to their dissatisfaction.

— The creative use of Web-based learning and experiential learning can help meet the challenges of training students in multiple sites.

— Medicine needs to get real about aligning medical education with societal needs. Otherwise, other health professionals are prepared to step in and assume primary care roles.

— The public health perspective helps students understand the impacts of community on health and of individual health on the health of the communities.

— We need to transform the feeling of what it means to be a good physician and a good nurse and look at teamwork and collaborative training from both the medical and the nursing side.

— How can we take current medical students and have them feel passion for the profession? How can we build a generation of health professionals that will make a difference in the lives of patients and populations?

— Academic health science centers and colleges of medicine need to embrace all of medicine and involve the entire community.

— This is the time to use the electronic tools of the 21st century to accomplish the timeless values and goals of medicine.

— Everyone is concerned about the cost of education and the debt that comes with the process of becoming a physician today. What should be the cost of becoming a physician?

— One of the greatest challenges is the significant maldistribution that exists culturally, geographically, and within specialties in American medicine.

— How can we be more multi-disciplinary in our efforts, both in

team care and in education, to improve the quality of care?

— We need to focus on curriculum, to think about education starting with the basics and not keep doing what we've been doing.

— Program tweaks won't be enough. We need to rethink the whole thing. Medical schools should consider creating a whole new product, a Doctor of Clinical Medicine, licensed for primary care. Otherwise medical schools are going to abandon an important niche.

— We need to re-examine what we mean by excellence and actually get at all the "E's"—excellence, effectiveness and equity.

— We need to figure out how to create longitudinal clinical relationships in an otherwise discontinuous operation. We need to do a better job of connecting and balancing both clinical experience and knowledge.

— The cognitive dissonance between what we say we believe and what we actually do is damaging to the developing physician, nurse, or other health professional.

— How can the educational structure and the incentive structure in the practice sector lead, or lure, people in the health sciences into lives of service.

— Serious issues of faculty retention will impact medical centers as places to work as well as places to educate the next generation of health professionals. The financial model on which medical centers are based and run also needs to be re-examined.

— We need to think about the social responsibility and mission of our medical school programs so we can align our programs with the needs of society.

— To address the diversity problem, we need to shift from the current recruitment and retention model to a model that looks more at attracting a diverse group of students and helping those in medical school thrive.

— We need to think about how we take the best out of both worlds, out of the academic health center model and the community-based medical school model, and grow something new and different to turn out medical students who are excited by the

best things we see in research in the academic health centers, yet have some of the positive attributes emphasized in community-based medical schools.

— We need a viable care model to meet the health needs of society, to define the role of physicians and non-physician health professionals working in partnership, and to provide the leadership needed to develop the kind of coherent health system we currently don't have.

— We do a great job of teaching students how to understand the details and small pieces, but we need to do a better job with the big picture, to teach them, when working with a patient, how to integrate that piece into the big picture.

— Physicians need to learn about informatics. Medical students get it very quickly and understand it is relevant for their education.

— One of the saddest compliments I ever received was from a student who said I was the only person he had met in four years of medical school who liked being a doctor. That's one of our challenges.

— How do we truly expand clerkship capacity, and not just simply increase competition for the existing slots? Maybe we need to look at what clerkship really means and what we're really looking for.

— A central problem is how medical school, residency, fellowship, and practice can be linked behaviorally.

A Descriptive Overview of the Expansion of Medical Education in the Early 21st Century

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Medical education in the United States is in the midst of a second major wave of expansion in the modern Flexnerian era. Projections from mid-2008 indicate that M.D.-granting medical schools will have increased their medical student class size by approximately 5,000 students in the first two decades of the 21st century—an expansion of educational capacity of 30 percent.

This paper provides descriptive information on the methods and strategies that M.D. granting institutions are employing to achieve this enrollment growth.[i] We review the models of expansion and the impact of each type of expansion on overall enrollment projections; examine the stated purposes and justifications for some of these expansion efforts; review major challenges that schools face in expansion and the strategies they employ to overcome those

Table 1
Models of Expanding Class Size at Existing Medical Schools

Model	Description	Example
"In place"	Expansion occurs at the existing academic medical center campus and at nearby clinical facilities.	University of Texas Medical School at Houston increased its enrollment from 200 to 230 for the 2007-08 academic year. By 2011, plans are for overall medical student enrollment to increase to 920 students, as compared to 800 in 2006.
Distributed education: Regional 2-year campus	Branch campus at a distance from the main medical school site offers some of the medical student curriculum to a portion of the class (most commonly clinical education).	University of Arkansas for Medical Sciences has plans to establish a clinical campus in northwest Arkansas between 2009 and 2011.
Distributed education: Regional 4-year campus	Branch campuses that offer all four years of medical education while operating under the accreditation umbrella of the educational program on the main medical school campus.	Michigan State University College of Human Medicine established a new four-year medical education program in Grand Rapids; this new campus will increase overall enrollment at the medical school from 100 to 200 by 2010.

i We caution readers that the data in this paper were current as of September 2008, but the expansion of medical education in the United States is dynamic and fluid. Changes surely will have occurred in the landscape of medical school expansion between the time we finalize this manuscript and its publication.

strategies; and close with several observations on lingering questions or unresolved issues.

I. TYPES OF EXPANSION

We state the obvious: that there are two methods of expansion of undergraduate medical education: an increase in class size at existing medical schools or the creation of new schools. While expansion at existing schools comprises the bulk of enrollment growth (discussed in detail below), we also review the status of several new schools.

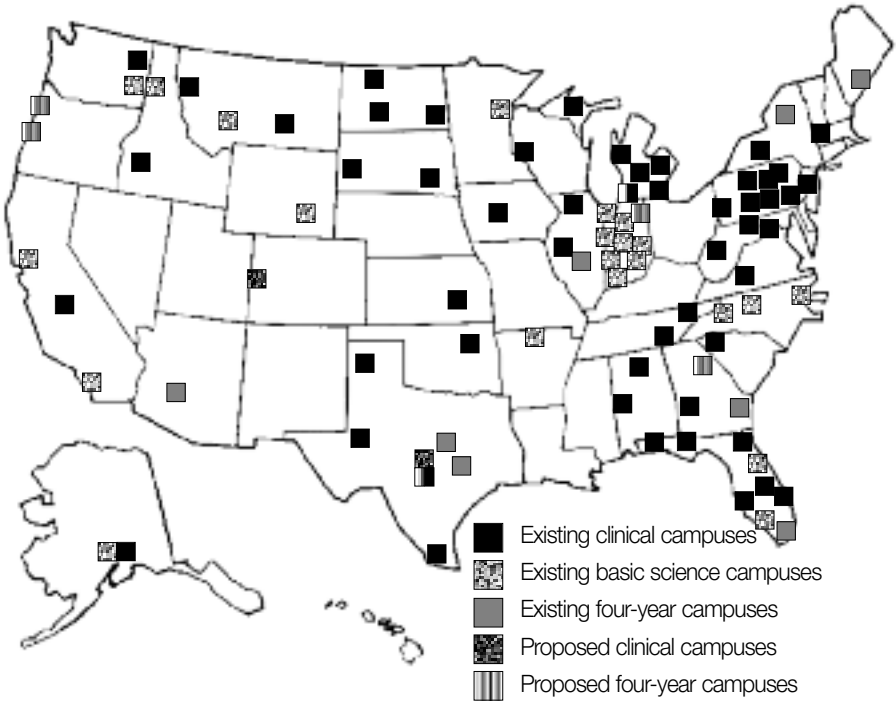
Existing Schools

Class-size expansion at existing medical schools typically follows one of two models for growth: "in place" or through a "distributed education" model of new regional campuses ***(Table 1)***. For schools expanding on the existing academic medical center campus and at nearby facilities (that is, through the "in place" model), the lack of infrastructure capacity is a common limitation: many schools simply do not have the room to grow on their existing campuses. Schools with plans to expand their class size through new or enlarged regional campuses often face similar challenges in terms of infrastructure and facilities, yet these institutions more often can construct new facilities, renovate existing ones, or partner with hospitals or other healthcare providers in these outlying communities.

Medical schools have employed three predominant types of regional campuses. First, and most common, is a regional clinical campus, which offers some portion of clinical education to third- and fourth-year medical students. As of September 2008, 55 clinical campuses were operational at 29 U.S. medical schools; another 10 clinical campuses had been planned or proposed ***(Figure 1)***. The second type of regional campus is the "basic science" campus, which offers the curricula of the first and second year. Five medical schools are operating 17 basic science campuses as of September 2008. The third type of regional campus—the four-year branch campus—offers all four years of medical education while operating under the accreditation umbrella of the educational program on the main medical school campus. Existing or proposed four-year branch campuses include the following:

— University of Arizona College of Medicine–Phoenix in Partnership with Arizona State University (opened 2007)

Figure 1
Existing and Proposed Regional Campuses at U.S. Medical Schools, 2008



— University of Illinois-Chicago College of Medicine — Urbana/Champaign, Medical Scholars Program (opened 1971)

— University of Miami/Florida Atlantic University–Boca Raton (opened 2007)

— Texas A&M Health Sciences Center College of Medicine – College Station and Temple (opened 2007)

— Mercer University School of Medicine – Savannah (opened 2008)

— Michigan State University College of Human Medicine – Grand Rapids (proposed for 2009)

— Indiana University School of Medicine – Fort Wayne (proposed for 2009)

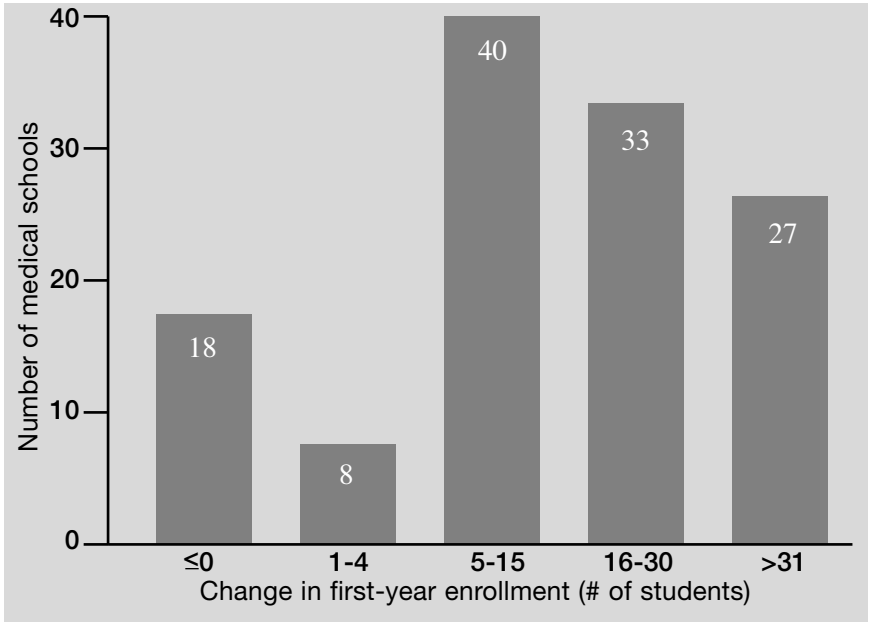
— Medical College of Georgia / University of Georgia – Athens (proposed for 2010)

— Oregon Health and Sciences University School of Medicine — Eugene and Corvallis (proposed, but planning currently on hold; no opening date set)

Plans to Increase Enrollment at Existing Schools

According to a May 2008 report from the Center for Workforce Studies (CWS) at the Association of American Medical Colleges (AAMC), 108 (86 percent) of the then 126 medical schools accredited by the Liaison Committee on Medical Education (LCME) had either increased or had planned to increase their first-year enrollment over the subsequent five years compared to their baseline 2002-03 enrollment figures.[1] Based on its data collection, the CWS projected an increase of 2,635 (16 percent) first-year medical students from 2002-03 to 2012-13 at existing schools. Not all existing schools have increased or planned to increase their enrollment by a similar amount.[ii]

Figure 2
Magnitude of Projected Changes in First-Year Enrollment for Existing Medical Schools, 2002 to 2012



(Courtesy of: Center for Workforce Studies. (2008). *Medical School Enrollment Plans: Analysis of the 2007 AAMC Survey.* Washington, DC: Association of the American Medical Colleges. Used with permission.)

ii The AAMC's 2006 Physician Workforce Statement calls on an aggregate national increase of 30 percent in medical student education capacity. It does not require that each medical school increase enrollment 30 percent; the statement recognizes that some schools may increase by a greater amount while others may expand only marginally or not at all

Eleven M.D.-granting medical schools will have expanded their first-year class size more than 50 percent compared to their baseline 2002-03 enrollment; four schools will have doubled their class size. But 18 schools neither increased nor had plans to increase first-year enrollment compared to their 2002-03 baselines ***(Figure 2)***.

Variation exists in medical student enrollment increases among different types of medical schools. According to the CWS report, two of three new enrollment slots will be added in public institutions, and one third in private institutions (in 2002-03, 60 percent of first-year medical students were enrolled in public institutions, 40 percent in private institutions). Medical schools in the south and west are increasing class size more substantially than are schools in other parts of the country, coincident with overall population growth ***(Table 2)***. Moreover, larger gains are occurring in the so-called "community-based" medical schools, which have missions to educate students in community settings (see Appendix A for more information on community-based schools). At the 18 M.D.-granting community-based schools in the United States, first-year enrollment is projected

Table 2
Planned Increase in First-Year Enrollment by Institution Type and Region (Existing schools only)

	Baseline enrollment 2002-03	Planned increase 2012-13*	Percentage increase from baseline
Institution type			
Private	6,607	814	12.3%
Public	9,881	1,821	18.4%
Region			
Central	4,497	548	12.2%
Northeast	5,021	480	9.6%
South	5,129	1,208	23.6%
West	1,841	399	21.7%
All schools	**16,488**	**2,635**	**16.0%**

* In 2007, each school was asked to provide their current first-year enrollment and expected first-year enrollment for each of the subsequent 5 years, ending with the 2012-12 academic year. (Courtesy of: Center for Workforce Studies. [2008]. *Medical School Enrollment Plans: Analysis of the 2007 AAMC Survey*. Washington, DC: Association of the American Medical Colleges. Used with permission.)

to climb 31 percent between 2002 and 2012, compared to 16 percent for the whole medical school population.

New Schools

At the same time that student enrollment is growing significantly at existing medical schools, the academic medicine community is also witnessing a spate of activity from entities planning and proposing the development of new medical schools. Some of these proposals have come from major universities, while others have emerged from organizations with no existing infrastructure. Some of these new schools are being created in or near existing medical schools; in other cases they are located in regions without a medical school and with workforce shortages. In all cases, new schools stand to contribute substantially to this period of medical education expansion. Three new medical schools — Florida International University, University of Central Florida, and the Paul L. Foster School of Medicine (Texas Tech University Health Sciences Center, El Paso)[2] — received preliminary accreditation from the LCME in February 2008.[3] These schools have begun to recruit students and accept applications, and they plan to enroll their first students in Fall 2009.

As of September 2008, five medical schools had "applicant school" status with the LCME ***(Table 3)***. Applicant schools each have paid a $25,000 application fee to the LCME to begin the process of applying for preliminary accreditation, and the LCME Secretariat staff has determined that the school meets the basic eligibility requirements to apply for accreditation (i.e., a current or anticipated charter and

Table 3
Medical Schools with LCME "Applicant School Status" (as of September 2008)

Name of medical school	Location
Scripps School of Medicine	La Jolla, CA
Oakland University Beaumont Medical School	Rochester, MI
Touro University College of Medicine	Hackensack, NJ
Hofstra University School of Medicine	Hempstead, NY
Virginia Tech Carilion School of Medicine	Roanoke, VA

Source: LCME (http://www.lcme.org/newschoolprocess.htm

plans to offer the educational program in the United States). One institution — Commonwealth Medical College in Scranton, PA — had status with the LCME as a "candidate school" as of September 2008. A candidate school has met the requirements of an applicant school; has submitted the required database and planning self-study documents, which have been favorably reviewed by the LCME; and has received approval from the LCME for a site visit for preliminary accreditation.

In addition to these nine institutions in various stages of the accreditation process for becoming new M.D.-granting medical schools, many other institutions are exploring the possibility of, or actively planning for, the creation of new medical schools — including,

Table 4
Projected First-Year Enrollment for New or Planned Medical Schools

Institution (State)	Year			
Schools with LCME preliminary accreditation	2009	2010	2011	2012
Florida International University College of Medicine (FL)	40	40	80	120
University of Central Florida College of Medicine (FL)	40	60	80	100
Paul L. Foster School of Medicine (TX)	40	60	80	80
LCME candidate schools				
The Commonwealth Medical College (PA)	60	72	84	96
LCME applicant schools				
Scripps School of Medicine (CA)	*	*	*	*
Oakland University Beaumont Medical School (MI)	*	50	75	100
Touro University College of Medicine (NJ)	40	60	60	80
Hofstra University (NY)	*	30	45	60
Virginia Tech University (VA)	40	40	40	40
Possible new medical schools based on media reports				
University of California – Riverside (CA)	*	*	*	50
University of California – Merced (CA)	*	*	*	*
Idaho State University (ID)	*	*	*	*
Western Michigan University (MI)	*	*	*	*
University of Houston (TX)	*	*	*	*
Total for all new schools	**240**	**442**	**589**	**786**

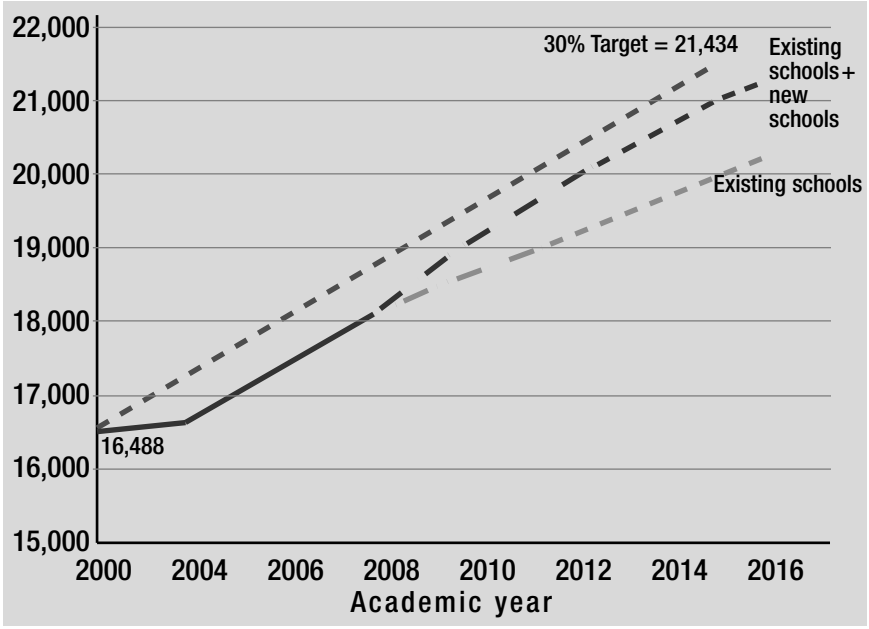
* Enrollment data unavailable

(Adapted from: Center for Workforce Studies. [2008]. *Medical School Enrollment Plans: Analysis of the 2007 AAMC Survey.* Washington, DC: Association of the American Medical Colleges. Used with permission.)

among others, the University of California-Riverside; University of California-Merced; Idaho State University; Western Michigan University; and University of Houston.

Although enrollment plans were not publicly available at most pre-accreditation institutions, the AAMC's Center for Workforce Studies' May 2008 report estimated that 786 first-year students would enroll at the 14 new and planned schools in the 2012-13 academic year ***(Table 4)***. Combining enrollments at these new schools with the increases at existing schools, the CWS report projected that M.D.-granting U.S. medical schools would enroll 19,909 first-year medical students in the 2012-13 academic year, a 21 percent increase compared to 2002-03 ***(Figure 3)***. Furthermore, the report estimated 21,434 first-year medical school matriculants by 2017, a 30 percent increase in first-year enrollment compared to 2002-03.

Figure 3
Projected Number of First-Year Matriculants at U.S. Medical Schools, 2009-2017



(Courtesy of: Center for Workforce Studies. [2008]. *Medical School Enrollment Plans: Analysis of the 2007 AAMC Survey.* Washington, DC: Association of the American Medical Colleges. Used with permission.)

II. THE PURPOSES OF EXPANSION

The reasons that existing medical schools are expanding and that new schools are being created are both obvious and obscured. These expansion efforts have been aimed at meeting the need to produce more physicians. More broadly, these efforts are then correlated to the healthcare needs of the community, region, state, or nation—for example, to educate more physicians who will treat underserved populations or communities. Workforce needs, however, are not the only stated reason for the expansion of medical schools—no more so than undergraduate medical education is the sole purpose of any academic medical center. Many universities have released public statements about the economic development benefits to the surrounding community from this expansion; other expansion plans have been linked to biomedical research development.

In this section, we explore several of the rationales that medical schools, universities, and communities have offered to expand medical education in the early twenty-first century. Relying on publicly available documents, this section is descriptive and illustrative of the public discourse on medical school expansion, but we do not intend it to be exhaustive.

Quantity and Composition of the Physician Workforce

The most obvious goal of medical student expansion is to increase the overall future supply of physicians so that the public has adequate access to physician services. Surely every new or expanding medical school has identified the need for an overall increase in the number of physicians as a basis for their expansion plans.

However, the discourse over physician supply involves not only the overall number, but also the composition of medical students and future physicians the schools enroll. Whereas many existing medical schools have pipeline programs, outreach initiatives, academic enrichment, and financial aid to support their efforts for greater diversity in their student body (and all LCME-accredited schools will be required

iii In June 2008, the LCME adopted the following revised standard (MS-8), effective July 1, 2009. Each medical school must develop programs or partnerships aimed at broadening diversity among qualified applicants for medical school admission. The LCME annotation states that "schools should work within their own universities and and/or collaborate with other institutions to make admission to medical education programs more accessible to potential applicants of diverse backgrounds. Schools can accomplish that aim through a variety of approaches, including, but not limited to, the development and institutionalization of pipeline programs, collaborations with institutions that serve students from disadvantaged backgrounds, community service activities that heighten awareness of and interest in the profession, or academic enrichment programs for applicants who may not have taken traditional pre-medical coursework" (LCME, 2008).

to do so starting in 2009),[iii] fewer schools have promoted specific diversity initiatives within the context of class size expansion. Less than one third of schools (34 of 113) responding to the AAMC 2008 survey on enrollment plans, for example, indicated that their recent or planned increases in enrollment were targeted to specific population groups or underserved communities; the majority of these 34 schools were targeting an increase in the number of minorities currently underrepresented in medicine.

That said, several programs have focused on historically disadvantaged communities. Expansion of medical education in the University of California system, for example, is planned to produce new physicians who will address rural health (UC-Davis), Spanish-speaking Latino communities (UC-Irvine), the disadvantaged communities in Los Angeles (UCLA), health disparities (UCSD), and the urban underserved (UCSF).[4] The goal of the new combined B.A./M.D. program at the University of New Mexico is to expand the number of physicians in rural areas of New Mexico.[5] Yet, while these programs and others like them may help to produce physicians interested in practicing in underserved populations, the number of new doctors educated through distinctive programs tends to be small. New Mexico's B.A./M.D. program enrolls 16 students per year, the first of whom will not enter clinical practice until 2016; the University of California system plans to increase the number of medical students enrolled in its distinctive programs by about 60 per year.

Regional Health Needs

A second purpose, related to the first, that schools have offered for their expansion of medical education is to attend to the health needs of the state or region. With the large number of U.S. residents in medically underserved areas (e.g., rural areas or inner cities), some medical schools have focused their efforts on expanding the geographic distribution of physicians as a means to improve access to care for people who need it most.

To be sure, specialized programs like rural training tracks have existed for decades, and many have records of successful outcomes.[6] It is beyond the scope of this paper, however, to provide an inventory of all specialized tracks and programs in U.S. medical schools that enroll and educate students for careers in underserved areas. Rather, we highlight the ways in which several existing and new schools

have specifically incorporated this mission as an institutional priority in their expansion planning. While it remains to be seen whether these new programs are implemented as described in university news releases, these examples reflect the ways in which medical schools integrate expansion plans with social missions:

— *University of Oklahoma School of Community Health*. In February 2008, the Tulsa branch campus of the University of Oklahoma College of Medicine announced that it would change its name to the School of Community Medicine at the behest of a $50 million gift from a family foundation. The Tulsa campus shifted its focus to an "explicit purpose… to improve the overall health status of underserved Oklahoma communities, both rural and urban, by providing additional community-based medical student education programs and resident training, and increasing the number of physician graduates."[7]

  Students will be selected for the School of Community Medicine at the time of their admission. Prior to and after their first year, these students will participate in summer "institutes" in Tulsa in community medicine, translational research, public health research, underserved and at-risk populations, and community health outcomes. These students will then attend the Tulsa campus in their third and fourth years. The new program will increase enrollment at Tulsa from 40 students to 70 students in the final two years (the Tulsa campus will remain a clinical branch campus).

  The school plans to use $7.5 million of the gift for scholarship and loan forgiveness programs for graduates who practice in underserved rural and urban areas in Oklahoma. The school also plans to expand residency programs in internal medicine, surgery, and pediatrics. The OU School of Community Medicine set a five-year goal of 80 percent of its graduates practicing in Oklahoma and working with underserved populations (currently 42.5 percent of all University of Oklahoma medical school graduates practice in state).

— *The University of Kentucky College of Medicine Rural Physician Leadership Track*. The UK College of Medicine created this special track, aimed to train physicians to serve in the state's underserved

rural areas, in June 2008. The goals of the program are "to increase the number of physicians who are trained to provide high quality health care, who are knowledgeable about community health, and who will address the acute shortage of physicians in rural areas of the Commonwealth and the Nation."[8] This program will use branch campuses in Morehead and Murray, KY, for the third and fourth years of medical student training to offer exposure to nontraditional community educational experiences.

According to the university's website, the track will have "more specific objectives and competencies" for students in such content areas as populations-based study and research; health promotion and disease prevention; and study of community health systems, services, and agencies. The program's outcome measures will include practice location of graduates and their leadership and contributions to their communities.

In addition to these specialized programs at existing schools, many new medical schools highlight their intention to serve the needs of their communities and region. For example, the Paul L. Foster School of Medicine (Texas Tech University Health Sciences Center), which received preliminary accreditation for its new medical education program in February 2008, emphasizes "border health." According to a representative from the school, El Paso medical school graduates "may encounter biblical diseases such as plague and other ailments that have virtually been wiped out in the United States but flourish in many emerging nations."[2] The University of California, Riverside, which hopes to enroll 50 first-year medical students in a new medical school in 2012, emphasizes "improving the health of Californians, with special attention to the needs of the diverse and growing inland Southern California region."[9] The institution's research would also focus on the health needs of the area.[10] Similarly, the University of California, Merced, has made a public statement expressing their interest in training students to understand and treat chronic diseases that are prevalent in the area.[10] The Commonwealth Medical College in Scranton, PA, which became an LCME candidate school in June 2008, underscores its distributed clinical campuses structure through which students will be educated in community sites to mirror the experiences they will encounter in practice.

iv See Appendix A for an analytic definition of community-based schools.

While many of these new medical schools stress their linkages to the community and attention to the health needs of the region, these efforts do not appear to comprise a "community-based" movement comparable to that in the 1970s, when many of the new schools were founded to increase the "relevance of medical practice to social needs."[11] [iv] Sixteen of the 22 schools that received full LCME accreditation between 1975 and 1985 were considered "community-based" schools. That 1970s-style community-based movement stands in contrast to today's expansion, in which most of the proposed and planned new schools have adopted a traditional academic medical center model.

Biomedical Research and Training

Medical school expansion in the early twenty-first century is not only about medical student education and physician workforce needs. Another component of the development of new schools and expansion at existing schools has been the desire to grow the biomedical research and training enterprise.

Development of the Research Enterprise at New Schools

Two of the five proposed new medical schools that have applicant status with the LCME are devoted to the training of physician scientists:

— The primary purpose of *Scripps School of Medicine* in San Diego is to train physicians for dual careers in patient care and research. Plans for the five-year curriculum at this school include courses as well as training in clinical trials and research in order to facilitate and promote translational research. One of the physicians helping to launch Scripps School of Medicine said, "Students [at the school] will have a stipulated interest in becoming physician scientists, not only for the care of patients but to conduct research to change the future of medicine."[12] Scripps hopes to enroll its first 50 students in 2013.

— *Virginia Tech Carilion School of Medicine*. Virginia Tech University and Carilion Health System have partnered to create a private medical school dedicated to training physician researchers. Modeled on the Lerner College of Medicine at The Cleveland Clinic, the Virginia Tech/Carilion alliance plans on a small class (40 students per year) that will receive training in research meth-

> ods, conduct original research, and write a senior thesis during a five-year curriculum. The rationale for the new school rests, in part, on workforce shortages—"[The] area's physician population is aging—graduating physician specialists are more likely to locate close to the place where they received their training"[13]—and more specifically, on the need for more physician researchers. According to the institution's website, "The school will also help fill a national need for research physicians; less than 2 percent of active physicians are pursuing careers involving research."[13]

Virginia Tech and Carilion acknowledge other benefits as well. For Virginia Tech, "access to medical research opportunities and funding is necessary for the school to achieve its top-30 research university goal;" for Carilion, "the school and research institute will also provide valuable support to Carilion's conversion to a clinic model."[13]

Development of the Research Enterprise at Existing Schools

Based on our research, while the justification for expansion of existing medical schools typically rests on projections about future regional and national physician workforce shortages, the development of the biomedical research enterprise also plays a significant role at some institutions.[14]

Some schools are enhancing their research capacity and capability at the same time they increase medical student class size. For example, at the University of Texas Medical School at Houston, plans for in-place expansion include a focus on enhancing the existing research base. Following the flood from Tropical Storm Allison in 2001, the school renovated and rebuilt its education and research space, including a new research building. This new space gave the school the capacity to hire additional faculty members and to centralize the vivarium for research animals. In 2006, UT-Houston faculty received an NIH Clinical and Translational Science Award that will lead to the creation of a new Center for Clinical and Translational Science. Academic leaders expect that the additional faculty hired for these research initiatives will simultaneously provide additional educational and research opportunities for the larger medical student class size and afford existing faculty more time for research.

In another example, Texas A&M Health Science Center hopes to benefit from its four-year regional campus in Temple by establishing

more clinical and translational research projects with the Scott & White Clinic. The Health Science Center also hopes to build upon recent joint faculty appointments and equipment-sharing with its undergraduate sister institution in College Station, where substantial basic science research and collaborative projects are already in place.

For other existing medical schools, the expansion of the biomedical research enterprise plays a much larger, transformative role. Michigan State University College of Human Medicine, for example, is positing its four-year regional campus in Grand Rapids as a "community-based school for the new millennium." As part of its strategy, CHM and the university will establish the research infrastructure necessary to avail ourselves and our partners of the opportunities presented by two four-year medical schools and six community campuses with the intent of rapidly establishing a leadership position in this field of community-based translational research, epidemiology, and health services.[15]

Attracting new research funding and incubating new life science business ventures in Grand Rapids are among the objectives for the medical school's research expansion. Moreover, in their vision statement, the school included the hope that the new campus "will be the keystone for the development of western Michigan as a center for life sciences commercialization" and that "Grand Rapids will become the center of molecular medicine research."[15]

This vision has driven private investments to the school to finance its expansion plans. Local philanthropists and Michigan State University partner organizations desiring a greater medical and research enterprise in the community provided initial funding for the regional campus, which has allowed the school to begin development of the campus without any new state appropriations. For the private partners, the opportunity to connect basic science and translational researchers with a large clinical enterprise enhances the prospect and environment for translational research while also adding to their clinical research base.

Both new and existing medical schools that hope to grow a large research enterprise face the challenge of relying on "soft" dollars to fund research positions. In our study,[14] one administrator noted about this financial model:

> What's interesting is that these [new] faculty are hired on soft money. They are guaranteed three years of funding…but after that… that money will be gone…We haven't had any problem recruiting faculty on this soft money, but who knows what will happen in three years. Hopefully it will work out that we can keep them (that is, they generate enough grants to cover their positions), but there are no guarantees.

Therefore, a key challenge for schools expanding their research missions will be to sustain funding for research faculty (or supply bridge funding). At one institution, the hope is that increased revenue from tuition will sustain these positions, at least in the short term. Another institution noted it had lowered the number of new faculty that it hoped to hire because of the uncertainty of long-term funding. "We wanted to grow faculty by 100, but more realistically, we are looking at 32 basic science faculty and 35 clinical faculty additions. I wonder if we will have enough money over the long term."

Economic Development

A fourth oft-cited justification for the expansion of medical education is the contribution to the local and regional economy. Here, the rationale is less about undergraduate medical education, *per se*, and more about the entire academic-biomedical enterprise. Medical schools, their parent universities, and affiliated hospitals serve an important purpose in the economy of the region in which they are situated. Medical schools bring in hundreds of faculty members, who often attract outside funding, and they employ large numbers of staff and administrators. Through institutional and employee spending, the creation of jobs, the attraction of new business, and the development of the research enterprise, these institutions often function as engines of significant economic growth.

New medical schools—especially those that hope to garner public financial support, but also those private institutions that are courting favorable public opinion—are quick to highlight that contribution. In an economic impact study, Florida International University estimated that, by 2025, the school will have created 8,300 new jobs, will contribute $62 million in state taxes, and will have an annual economic impact of $1.1 billion. A similar study for the Phoenix campus of the University of Arizona showed $1.1 to $2.1 billion in annual economic impact by 2025, along with the creation of 14,000 to 24,000 new

jobs and $60 million to 110 million in annual government revenue. The University of Central Florida study found $1.4 billion in annual economic impact; a study conducted for the Austin, Texas Chamber of Commerce reported that a medical school in that city would have a $2.1 billion annual impact.

The basis for this economic impact typically rests on assumptions about the quantity of biomedical research and subsequent commercialization. In computing a $2.1 billion annual economic impact, the Austin, Texas economic study, for example, assumed "typical NIH grants levels at *major medical schools and established commercialization*."[16] Some schools project subsequent growth in the biotechnology industry, including the creation or expansion of private biotech companies in the surrounding areas. The following statement was part of a news release from Hofstra University on the subject of its new medical school:

> The establishment of a medical school is important for the continued growth of the Long Island region, allowing for the cultivation of research and development, and a growth in innovative high-tech and biotech industries. According to the 2007 Long Island Index, a report of the Rauch Foundation, wages on Long Island have stagnated (while rising in the U.S.) and that innovation as measured by investment by venture capitalists and federal research and development was minimal.
>
> "Today's announcement by Hofstra University and The North Shore-LIJ will have a lasting imprint on the future of Nassau County," said New York State Senate Deputy Majority Leader Dean G. Skelos. "Through this visionary collaboration, the medical school and the research it spurs will offer tremendous new opportunities to local students, propel our region's burgeoning biotechnology sector and provide a new source of pride for all Long Islanders."[17]

Similarly, the Oakland University Beaumont Medical School in Michigan—a partnership between Oakland University and Beaumont Hospitals—lists on its website the benefits that will be derived from the school, which include "new jobs," "hundreds of millions of dollars into the region's economy in the first year alone," and "opportunities

in emerging technologies in bioscience and medicine."[18]

In this paper we do not intend to evaluate the methods of the various economic impact studies or the claims of research-based economic development that will accrue to the surrounding regions in which new or expanding medical schools will be located. Clearly, academic medical centers have significant economic impact, regardless of how that impact is calculated. Rather, we hope these examples illustrate the extent to which institutions are promising demonstrable benefits to their stakeholders—benefits that are strongly based on assumptions of a favorable research environment and a traditional model of robust academic-biomedical research that also derives financial support from traditional sources at traditional levels.

III. CHALLENGES AND STRATEGIES OF EXPANSION

Regardless of their motivation and purpose, medical educators face a number of daunting hurdles, including expansion of medical student class size amid a turbulent healthcare environment; increased financial constraints; increasing diversity in the population and among high school and college students; and discord in faculty work environments. Drawing on our previous research,[14] in this section we highlight three of the panoply of challenges that medical schools may face—faculty resources, finances, and partnerships—and illustrate the ways in which some schools have worked to address and overcome those barriers.

Faculty Resources

Several challenges that have accompanied the expansion process have centered on faculty resources, including increased educational time demands for faculty, faculty recruitment, and the ability to provide faculty development to all types of faculty. Although some of these concerns may be common throughout academic medicine, many are more keenly felt at medical schools that are expanding because of the pressure to overcome these challenges in a relatively short time frame.

Increased Educational Time Demands

In the current environment of academic medicine, where basic science faculty feel pressure to secure grants to cover their salaries and clinical faculty feel pressure to generate patient care revenue, many faculty

members perceive that they do not have time to teach.[19] For both existing medical schools and new schools, class-size expansion can have serious implications for the recruitment of physicians and scientists to participate in the medical student education program. For example, the use of small-group discussions in the curriculum requires larger numbers of faculty facilitators than does a traditional lecture-based format. Many schools in our study struggled with recruiting additional faculty to cover these needs. Some schools reported that they were retaining clinical facilitators with mediocre skills and asking the best instructors to teach two course sections—a strategy that is likely unsustainable over time.

Some institutions have taken steps to explicitly acknowledge the educational component of many clinicians' roles. Many medical schools have instituted a "mission-based" approach to financing, so that departments are allocated funds based on how much teaching they do. This strategy rewards and recognizes teaching contributions in ways that are similar to those employed for clinical and research effort.

Medical schools also face challenges with recruiting and retaining volunteer faculty, who are often critical in providing clinical opportunities in community settings. Medical schools confront the reality that volunteer and community faculty must maintain productivity and revenue generation while engaged in educational activities. Medical education administrators in our study expressed their worries about volunteer faculty who were not paid to teach but whose clinical productivity could decrease as a result of working with students. Moreover, community volunteers may not be fully aware of this effect on their productivity.

These challenges mean that clerkship and course directors at expanding schools are finding it increasingly difficult to recruit volunteer physician faculty. To attract, reward, and show gratitude to volunteer faculty, medical schools have traditionally offered a menu of benefits to community physicians,[20] but these benefits typically are non-pecuniary in nature. Many medical educators hold mixed views on the future of true "volunteer" faculty. Clerkship directors and educational deans at the expanding medical schools in our study expressed skepticism about finding community faculty who would be willing to volunteer and speculated that schools would have to pay these individuals.

Faculty Recruitment

In addition to the demands on faculty time, the expanding medical schools in our study also faced challenges to ensure adequate numbers of faculty, especially in two domains: gross anatomy instructors and clinical preceptors.

One challenge for recruiting basic science faculty in medical schools is the misalignment between the teaching needs of a medical school and the training acquired by graduate students in basic science. The training and research interests of many Ph.D. graduates are not in the same areas for which they would receive teaching assignments. This issue is often keenly felt in anatomy, where the number of departments and the number of Ph.D.'s graduating in this discipline have decreased in recent years. Many medical schools find it difficult to sustain faculty expertise in the teaching of anatomy; in a survey conducted in 2002, 80 percent of department chairs responsible for the teaching of anatomy reported "moderate" or "great" difficulty recruiting qualified instructors to teach gross anatomy.[21] Moreover, this challenge was present before medical schools embarked on expansion plans.

Expanding medical schools have been forced to identify alternate solutions to address the challenge, including recruiting retired anatomy professors or hiring non-traditional instructors (one school employed a physical therapist with a Ph.D. in neuroscience). Other solutions can be found in the literature. For example, The Cleveland Clinic Lerner College of Medicine of Case Western Reserve University restructured its anatomy teaching and curriculum into a non-lecture, problem-based, clinically oriented curriculum that is integrated throughout the four years of medical education.[22] The case-directed educational program is delivered by clinicians under the guidance of the director of anatomy. In this approach, fewer anatomy instructors are needed, as students learn about anatomy in the context of clinical situations.

Another reason recruitment is a challenge is that the larger number of students requires additional placements with physician preceptors and facilitators. At several schools in our study, between two thirds and three fourths of the facilitators were not campus based, so this challenge was deeply felt. Identifying new clinicians to serve as facilitators required course managers to launch sizable recruitment efforts. Schools began recruiting more heavily in the external community, calling upon local physicians and retired physicians to be small-group leaders.

Faculty Development

Several hurdles related to faculty development have emerged at existing and new medical schools in the process of expansion. First, schools need to ensure that faculty members—both existing and new—have adequate training in curricular innovation related to class expansion. Second, for medical schools expanding through the creation of a regional campus, faculty development is sometimes needed for partners at the regional sites, especially if these instructors lack experience teaching medical students. In our survey, faculty development was an important issue among schools that brought in physicians from the community. These volunteer instructors sometimes need to improve or develop their skills in teaching, small-group facilitation techniques, and providing feedback to students on their performance. Several schools have addressed these faculty development needs through the use of Web resources, teaching workshops, hands-on training, and enhanced communication.

Medical School Financing

How schools pay for expansion is a fundamental concern. Here, we explore the costs of expansion at existing medical schools. Several factors are involved. First, one must understand the scope of expansion: Is the medical school simply adding more medical students within the existing infrastructure (so that additional costs are primarily "instructional" costs, which can be tied directly and specifically to the teaching program)? Or is the school also expanding its research programs, clinical services, and other resources to support a larger medical education program (so that additional costs are "total educational resource" costs, which reflect all essential costs of supporting the medical student education program, including research, scholarship, and patient care)?

Both approaches are evident around the country. For example, Boston University School of Medicine's new medical student enrollment increased from 155 in 2005 to 179 in 2006 by accommodating additional students within its current program. The BU expansion was a less complicated endeavor compared, for example, to that of Michigan State University College of Human Medicine, which is creating a new four-year school in Grand Rapids; or that of Texas A&M University Health Science Center College of Medicine, which continues to expand in both College Station and Temple, Texas. The MSU and Texas A&M expansions involve new facilities in distant locations,

affiliations with additional clinical partners, and, in some cases, the creation of an infrastructure to support additional research efforts.

These realities help to explain why some medical schools have been able to expand their class sizes with comparative ease while others may be stymied in their efforts. Some costs associated with medical student expansion are relatively minor—for example, purchasing additional equipment or electronic database licenses, or even hiring more staff or faculty. For other expansion needs—such as larger classrooms or clinical facilities—the costs may be prohibitive without multi-million dollar commitments from states, donors, or other sources.

Start-up and Long-Term Financial Challenges

Not all schools have cited financial issues as a challenge to expansion. The University of Texas Medical School at Houston, for example, receives funding from the state of Texas based on enrollment. Compared to the 2006 baseline of 200 students, UT-Houston's projections indicate a state funding increase of about $5.7 million per year in fiscal year 2011, when its 30-student expansion is fully implemented. The school has also projected $1.2 million in additional tuition revenue annually. Institutional officials indicated that these additional revenues were adequate to support the 30 additional medical students per year that UT-Houston is planning to accommodate in 2011.

Similarly, Boston University School of Medicine was able to fund its first year of expansion efforts through the increased tuition and fees generated by the additional first-year medical students (projections indicate that the additional tuition revenues going forward will continue to be adequate to cover additional costs). Both UT-Houston and Boston University have opened new facilities or renovated existing facilities as a means to accommodate additional students without the added costs of new construction.

Other expanding medical schools have faced far more daunting and immediate fiscal challenges. First was the challenge of formulating accurate cost estimates for the expansion efforts. State-supported schools typically make initial budget requests to state legislatures for planning, feasibility studies, and start-up costs. But how much start-up funding does a school need? These financial projections are not always calculated through a rigorous process. For example, the budget request to the state legislature at one institution "was not predicated on financial projections but, rather, on the need to pro-

vide a figure that would be acceptable to the legislature and one which the governor believed could be supported."[23]

To overcome the challenges involved in developing accurate cost estimates, several schools in our study formed a team of business analysts, institutional planners, information technology and media specialists, and course and clerkship directors to examine each course year by year to identify hidden costs. Financial officers noted the importance of these teams in identifying issues that they might have missed on their own. The results enabled these schools to reduce financial surprises to as great an extent as possible.

A second challenge in the start-up phase for many schools was receiving less money than requested or no money at all from the legislature. Many state-supported schools have found themselves in such a predicament. For example, the University of Arkansas for Medical Sciences College of Medicine requested $3 million in start-up funds plus $11 million in ongoing funding for a regional clinical campus in northwest Arkansas. Instead, they received $1.9 million for a two-year feasibility study. Oregon Health and Sciences University requested $10 million for the 2007-09 biennium for its planned regional campus expansion in the cities of Eugene and Corvallis; however, the legislature only funded $3 million designated for expansion in Portland, where the main campus is located, and not the $7 million designated for regionalization. As reported in a 2007 article in *Academic Medicine*, the University of Miami–Florida Atlantic University regional medical campus in Boca Raton received $1.55 million for planning between 1998 and 2000 but then received no funding for the two subsequent fiscal years, delaying the opening of the regional program.[24] In fiscal year 2005-06, the state had only authorized $6.4 million in annual recurring operating funds for the Boca Raton campus, even though they needed $14.4 million in annual operating funds to fully implement the four-year regional program.

The lack of predictability in state funding for medical school expansion certainly disrupted effective planning. As one participant in our study noted, "It's hard to know how to move forward without knowing where the funding will come from."

Strategies for the Financing of Medical Student Class-Size Expansion

Expanding medical schools face the same long-term financial challenges as do all medical schools, notably the predictability of revenue

streams to fund ongoing operations and invest in future growth. As with all medical schools, these expanding schools planned on several primary sources of revenue to support ongoing medical education programs. Three of the five state-supported medical schools in our study requested increases in state appropriations from their legislatures: Oregon Health and Sciences University, Texas A&M, and University of Arkansas for Medical Science. As detailed above, two of these schools received less for start-up costs than what they had requested, and none of the three had obtained recurring state funds for expansion at the time our study was conducted in 2007.

A second source of additional revenue for each school in our study came from additional tuition. In a few cases, these additional funds appeared to be adequate in and of themselves to cover expansion-related costs, as those additional marginal costs did not include major additions to infrastructure, such as new buildings or major renovation projects.

Philanthropy and private giving comprise another important source of revenue for medical school expansion. Oregon Health and Sciences University, for example, had received several gifts for the long-term expansion of its campus: a donation of 20 acres of land (valued at $34 million), where institutional leaders planned to build new educational facilities for health sciences programs; an anonymous $40 million gift for construction of a medical school building on the new waterfront campus; and a $1.5 million grant from a foundation for curriculum development and regional campus renovation costs. Michigan State University received a $10 million gift from an alumnus for developing a new medical education building and headquarters for the College of Medicine in Grand Rapids. In conjunction with Grand Action, a local nonprofit group, MSU raised over $35 million in gifts as of December 2007 to help cover the development and construction costs for this facility. Other medical schools have launched or were planning development campaigns targeting alumni and other donors for funds to be used primarily for scholarships.

Who Pays for Expansion?

Not surprisingly, the institutions in our study had no “magic bullets” for identifying revenue streams to cover the cost of medical student class-size expansion. State funding, philanthropy, and support from partner institutions were among the sources they reported.

The schools did not expect the infusion of cash from federal sources that had been possible in earlier efforts at medical school expansion in the 1960s and 1970s. In 1963, Congress passed a law that provided matching grants to help build new teaching facilities or rehabilitate existing facilities as long as medical schools raised their class size by five percent or five students, whichever was greater. Schools were awarded $2 of federal funds for every dollar they raised on their own. Further legislation in 1965, 1968, and the 1970s extended these financial incentives to medical schools with "capitation payments," which were specified sums per student. For example, in the late 1960s, schools that increased enrollment by more than five students received a base grant of $25,000, plus $500 for each student enrolled. In hindsight, these federal subsidies played a major role in doubling the number of medical school graduates.[25] In 2008, the likelihood of 1960s-style federal response—given both the structural constraints of the federal budget and the political environment—seem minimal. As of this writing, no bill before Congress would provide federal subsidies or incentives to medical schools to expand class size.

State-level responses do not appear to be much more robust. State governments have faced pressing financial demands in other health-related areas (e.g., covering the uninsured) in addition to transportation, K-12 education, pensions, and homeland security. As seen in Arkansas, Texas, Oregon, and elsewhere, some states have provided medical schools with one-time funding to increase their class size, but they have not provided ongoing operating costs—a worrisome situation, to be sure. Moreover, given the current economic climate in many states, higher education institutions may experience short-term cutbacks, never mind additional appropriations. For example, the State Legislature cut the University of Tennessee's budget by 3.6 percent in 2008, amounting to a $2.8 million reduction for the Health Sciences Center.[26] Schools may find it difficult to expand class size in an era of dwindling resources.

Working with Partners in Expansion

A third major challenge for new and existing medical schools is forging effective alliances with partners in the community. Medical schools are creating alliances with long-standing allies or new partners; with hospitals to expand clinical education opportunities or research institutes to forge scientific collaborations; and with organizations in the same city or across the state. Whatever the nature of

these partnerships, they pose challenges in the expansion process. A well-executed partnership offers opportunities to enhance an institution's mission for education, research, and clinical care.

The typical strategic partnership for the medical schools is with one or more hospitals; senior executives need to pay special attention to these relationships. The typical hurdle to be overcome is that medical schools and hospitals often have different cultures and ways of working. Consider the two following quotations from our 2007 study; the first comes from a medical school dean, and the second from an executive at the school's new hospital partner:

> An academic institution has a different pace than a business, so sometimes partners are frustrated with one another. The different cultures handle change differently, so you need to be aware of how others function. The medical education community is not used to "sharing." We all need to learn from one another (medical school dean).

> The medical school is very traditional in its process and that may not fit into the business culture here…. They don't understand that control for us is not deference to a department chair, for example—it is much more collaborative. They are used to a more autocratic process (executive at partner hospital).

These examples do not suggest that one partner was "right" and the other was "wrong," but rather that each had a different way of operating, of making sense of the world, reaching decisions, and determining success. These differences need to be acknowledged, confronted, and managed.

Many reasons exist for why some strategic alliances work and others flounder or fail. In the partnerships emerging from the expansion plans of the schools in our study, three themes appeared especially crucial: trust, respect, and compatibility.

Trust

Trust among partners is the unifying theme in the literature on strategic alliances. This is an important theme because an alliance between organizations is, at its heart, about intent, not response; the future, not the past.[27-30] One medical school official at an expanding school stated that a partnership will not come to fruition "if the parties don't get along."

Respect

A second theme in medical school expansion partnerships was respect. The medical schools and their partnering institutions came to respect each other not because the individual partners were equivalent in size, scope, or resources, but rather the respect grew out of an appreciation for the unique contribution each could offer the other. Respect for each partner was made apparent in everyday decision making as the expansion plans developed. One medical school that was expanding through regionalization issued the following statement:

> All parties mirror themes of cooperation and collaboration. All media releases have quotes from all the partners. There is no sense that [we are] imposing our point of view. Instead all partners are seen as equal. This [expansion] is seen as a good thing for our community. There are no real pockets of dissent [among partners because] the expansion will lead to increased opportunities for [state] residents.

Compatibility

Another crucial component of successful expansion alliances is compatibility: partners have to get along, understand each other, enhance the other's strengths, and respect the other's culture and values.[31] At some schools in our study, the medical school and its partners in expansion appeared quite compatible, as evidenced by the similar ways in which the partners talked about the benefits of the expansion. For example, in one city where a medical school was expanding, a representative of the hospital partners said, "This [partnership] is a key piece to all of our organizations' successes." Another concurred: "Having a four-year medical school will be synergistic with what is going on in this community. [The expansion] benefits the [medical school], but also enhances the life of the community."

Issues of compatibility may depend on what is at stake. At one medical school, the hospital partners were unfazed by the medical student class-size increase. "In terms of [the medical school's vision for expansion], I don't think it has made much of a difference in our partnership," said a hospital executive. "Incorporating a few more students isn't really a stretch for the hospital."

IV. CONCLUDING OBSERVATIONS

As new and existing medical schools ramp up to enroll 5,000 or more

additional students annually within the next 10 years, observers and commentators at the local and national levels continue to ask important questions about the purposes, processes, and outcomes of expansion. Some of these questions have been explored in the literature we cited earlier in this paper.[14,32] We conclude with a review of four questions that we find particularly critical yet unresolved:

1. How can the academic medicine community assure a diverse medical student body amid the increase in class size?

2. Will more physicians lead to improved health outcomes?

3. Will there be a concomitant increase in graduate medical education?

4. How will the academic medicine community know if it has achieved its goals?

Will Medical Students, and the Physician Workforce, Be Diverse?

Many medical educators remain concerned about how medical school expansion will affect the diversity of medical students and future physicians. A diverse physician workforce is an essential component in increasing the cultural competence of the profession and, thereby, improving access to healthcare in medically underserved areas. But as Cohen and Steinecke note, medical schools remain "in great need of documented ways to achieve substantially more racial and ethnic diversity."[33]

In addition to special admissions and programmatic initiatives, like those we described from the University of California system, many schools have implemented educational pipeline programs focused on elementary, high school, and undergraduate students that aim to support the academic preparation and aspirations of minority and low-income students. Others, such as Grumbach and Chen, propose post-baccalaureate premedical programs that target minority and disadvantaged students and can help increase students' acceptance into medical schools.[34]

But a steep challenge remains for medical school leaders in this time of expansion: how can they maintain and even increase the numbers of medical students from diverse backgrounds as the overall student body grows in size? The commitment to diversity in student recruitment and selection remains paramount.

Will More Physicians Lead to Improved Health Outcomes?

In the expansion of medical education in the 1960s and 1970s, commentators acknowledged the need for more physicians to meet rising demands, but they also recognized that overall M.D. output was only a part of improving the health of the public. These issues remain today. Medical educators have questioned how expansion plans can improve the health and well-being of the people in a region or state if fundamental health policy questions are not addressed. For example, some medical educators, such as Martin, have wondered how the need for additional primary care physicians is integrated into expansion plans;[35] others have questioned how the medical education community is addressing the inadequate distribution of physicians.[32]

Expanding the number of medical school graduates can only go so far to affect the health of a region, state, or nation—much more difficult is crafting coherent national and state policies for an integrated healthcare delivery system aligned with the needs of the public. The fundamental question, however, seems not to be "either-or" (should we improve the health system or increase capacity for medical education?) but, rather, how does one facilitate the other? How do we achieve the right balance between these two goals?[36]

Will There Be More Graduate Medical Education Opportunities?

While medical schools are increasing enrollments and will soon graduate more students, the number of practicing doctors is further predicated upon the number of graduate medical education opportunities. This link between increasing numbers of medical school graduates and the number of residency training positions available has been noted in the media and on campuses.[32,37] Yet, there does not appear to be much movement to expand these residency training programs at medical schools and teaching hospitals nationwide. As a clerkship coordinator in our 2008 study commented, "The bottleneck in medical education is in residency programs, and that is an issue we haven't heard addressed at all."[14]

Under current policy, the number of residency positions funded by the federal Medicare program is frozen at 1996 levels, meaning that GME programs would not receive additional Medicare funding to expand residency positions. Because Medicare is the largest explicit source of funding for residency training, institutions need 1) the Medicare cap

to be lifted; 2) other sources of GME funding to be identified; or 3) both. Whereas many groups have called for an end to Medicare restrictions on the number of funded residency positions, as of this writing, bills before Congress to increase the Medicare cap on GME have languished.

How Will We Know If We've Achieved Our Goals?

There appears to be little discussion about the outcomes or plans for evaluation of medical school expansion. Existing and new medical schools have carefully laid out their goals for expansion (e.g., producing more doctors for rural parts of the state, addressing the national physician shortage, increasing visibility, growing a research profile), but the ways in which they will evaluate their goals have not been discussed. How will schools determine if their efforts were successful? And whose responsibility is it to do so when so many stakeholders are involved in the process?

Simplistic ways to measure outcomes are available, to be sure: Did a particular school enroll the number of students it planned? Did a new school receive accreditation and graduate its first class? But a more rigorous evaluation could question whether institutions achieved their long-term policy goals, for example, of increasing access to care or improving the health of a population.

One complication in this type of assessment is that institutions do not always define their goals in outcome terms (the University of Oklahoma School of Community Medicine, as noted previously, is a noteworthy exception for identifying a goal of 80 percent in-state retention of its graduates). Moreover, policymakers and medical educators may embrace goals for expansion that have little to do with enrolling a larger number of medical students. A robust biomedical research enterprise, commercialization of intellectual property, and economic impact, for example, may entice politicians to support the expansion and may be laudable objectives, but these aims may also complicate the vision of what medical school expansion is about and how its success will be evaluated.

Identifying outcomes and outcome measures is not only a local endeavor but should be considered at the national level as well. At the end of the current expansion effort, how will the academic medicine community know whether the overall outcome is worth the effort? How will we measure its success? What questions should we ask now to be able to provide those answers later?

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Appendix A: Community-Based Medical Schools

For analytic purposes, the Association of American Medical Colleges (AAMC) defines a "community-based" school as one that 1) does not have an integrated teaching hospital; 2) received full accreditation in 1972 or later; and 3) is non-federal. This definition acknowledges two fundamental principles of these schools. First, community-based schools use community hospitals to achieve their educational mission (relying on community hospitals for clinical facilities rather than a traditional academic medical center hospital); therefore, only schools that do not have an integrated hospital are included in this category. Second, these schools emerged in or after the "community-based" movement in medical education, when reformers espoused increased ties between medical education and the community. By including schools that received full accreditation in or after 1972, when the first community-based school received full accreditation, this historical context is acknowledged. The AAMC uses this definition for analytic purposes; medical schools may refer to themselves as "community-based" using different definitions.

The 18 schools with full LCME accreditation that fit this definition include:

- East Tennessee State University James H. Quillen College of Medicine
- Eastern Virginia Medical School
- Florida State University College of Medicine
- Joan C. Edwards School of Medicine at Marshall University
- Mercer University School of Medicine
- Michigan State University College of Human Medicine
- Morehouse School of Medicine
- Northeastern Ohio Universities Colleges of Medicine and Pharmacy
- Ponce School of Medicine
- Sanford School of Medicine of the University of South Dakota
- Southern Illinois University School of Medicine
- Texas Tech University Health Sciences Center School of Medicine
- Universidad Central del Caribe School of Medicine
- University of Hawaii, John A. Burns School of Medicine
- University of Nevada School of Medicine
- University of North Dakota School of Medicine and Health Sciences
- University of South Carolina School of Medicine
- Wright State University Boonshoft School of Medicine

Growth and Change in Osteopathic Medical Education

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American Association of Colleges of Osteopathic Medicine

Osteopathic medicine was established in the 1870s by Andrew Taylor Still, a Missouri practitioner and Civil War surgeon who rejected many of the traditional practices of his day as ineffective and harmful. He coined the term *osteopathy* to describe his philosophy of practice, which included holism, an aversion to medications, the use of manipulation, and a focus on health and prevention rather than on disease. In 1892 he founded the first school of osteopathy in Kirksville, Missouri, and within 20 years his followers, called doctors of osteopathy (D.O.), founded schools in Des Moines, Chicago, Kansas City, and Philadelphia.[1,2]

Early osteopaths were prominent general practitioners in many small towns and rural areas (especially in the Midwest), where they founded hospitals and frequently were a community's only physician. As their numbers and distribution grew (and in the regulatory environment that emerged with the Progressive Era), these practitioners encountered resistance to their form of practice from many allopathic physicians and organizations—leading to decades of political and professional strife, during which DOs slowly gained full practice rights as physicians throughout the United States. By World War II, D.O.s were licensed for a full scope of practice in most states, and by 1973, they were licensed in all states.[2,3]

During the pre- and post-World War II decades, osteopathic education and practice changed significantly from its early years, as post-Flexnerian era reforms, coupled with an era of public health and scientific progress in the diagnosis and treatment of disease, led osteopathic schools to fully incorporate the biomedical and clinical sciences into their curriculum. The five original osteopathic[i] schools developed along this path, and the new schools that were founded between 1969 and 2000 were created with curriculum requirements in these areas, as well as such innovative (at the time) practices as system-based teaching and integrated curricula.[4,5]

i The present-day descendents of the five original colleges are Chicago College of Osteopathic Medicine of Midwestern University, Philadelphia College of Osteopathic Medicine, Des Moines University College of Osteopathic Medicine, Kansas City University of Medicine and Biosciences College of Osteopathic Medicine, and A. T. Still University – Kirksville College of Osteopathic Medicine.

A combination of factors in this 30-year period triggered a growth spurt of 14 new osteopathic schools, particularly in the 1970s, when eight of those schools were established. Heightened public policy concerns about physician shortages and the resulting political and professional support for the development and expansion of US medical schools were significant factors. The six publicly financed state osteopathic medical schools were founded between 1969 and 1976—in Michigan, New Jersey, Oklahoma, Ohio, Texas, and West Virginia—and many of the eight private schools founded in this era initially received at least some state or federal financial support as well. In addition, the geographic spread of osteopathic physicians (and their local professional organizations) and hospitals was a crucial factor in the establishment of all 14 new schools. By 2000, there were 19 US osteopathic medical colleges graduating 2,300 students per year, and some 42,000 osteopathic physicians practiced in a variety of specialties in the United States and internationally. In these decades, DOs increasingly became known as "osteopathic physicians" as opposed to "osteopaths," and "osteopathy" became "osteopathic medicine." The earlier terms are now used to describe non–physician trained DOs outside the United States.[5,7]

Since 2000, another growth spurt has been underway in the devel-

Figure 1
U.S. Colleges of Osteopathic Medicine

opment of new osteopathic medical colleges, as well as an increase in class size at many of the existing schools. Six new colleges have opened, three colleges have founded branch campuses, and several additional schools are in some stage of planning.[ii] Today there are 28 campuses in 22 states ***(Figure 1, Table 1)***. The total enrollment in undergraduate osteopathic medical education in the 2007-2008 academic year was 15,586, with 3,332 graduates and nearly 4,300 first-year students ***(Figure 2)***. About 4,500 matriculants enrolled in Fall 2008 (an increase of 83 percent since 2000), and this number is expected to exceed 5,200 by 2012 (not including any additional

Table 1
Colleges of Osteopathic Medicine in the United States (2008)

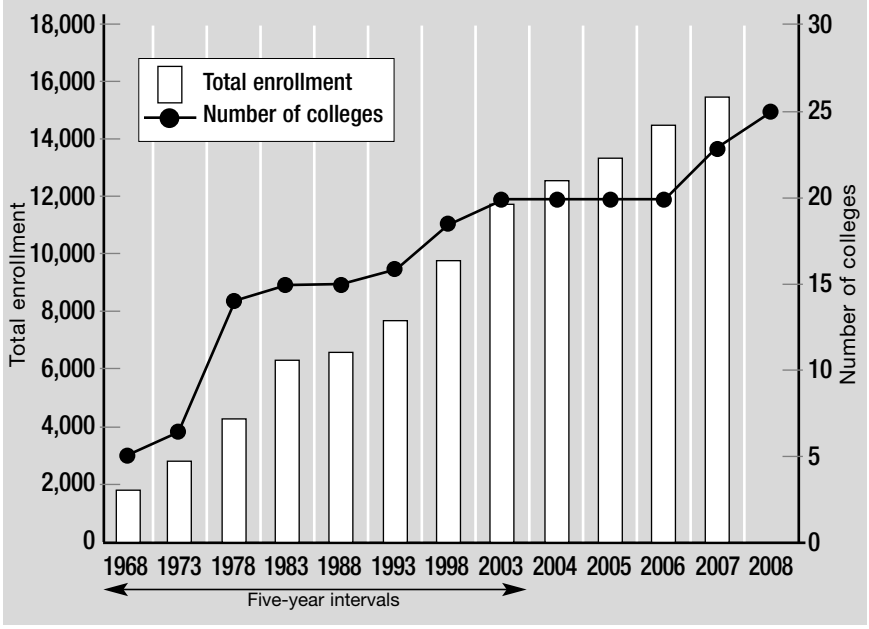
- A.T. Still University, Kirksville College of Osteopathic Medicine (ATSU/KCOM)
- A.T. Still University School of Osteopathic Medicine in Arizona (ATSU-SOMA)*
- Arizona College of Osteopathic Medicine of Midwestern University (AZCOM)
- Chicago College of Osteopathic Medicine of Midwestern University (CCOM)
- Des Moines University – College of Osteopathic Medicine (DMU-COM)
- Kansas City University of Medicine and Biosciences College of Osteopathic Medicine (KCUMB-COM)
- Lake Erie College of Osteopathic Medicine (LECOM)
  - Lake Erie College of Osteopathic Medicine – Bradenton (Branch) Campus (LECOM-Bradenton)*
- Lincoln Memorial University – DeBusk College of Osteopathic Medicine (LMU-DCOM)*
- Michigan State University College of Osteopathic Medicine (MSUCOM)
- New York College of Osteopathic Medicine of New York Institute of Technology (NYCOM/NYIT)
- Nova Southeastern University College of Osteopathic Medicine (NSU-COM)
- Ohio University College of Osteopathic Medicine (OU-COM)
- Oklahoma State University Center for Health Sciences – College of Osteopathic Medicine (OSU-COM)
- Pacific Northwest University of Health Sciences College of Osteopathic Medicine (PNWU-COM)*
- Philadelphia College of Osteopathic Medicine (PCOM)
  - Georgia (Branch) Campus – Philadelphia College of Osteopathic Medicine (GA-PCOM)*
- Pikeville College School of Osteopathic Medicine (PCSOM)
- Rocky Vista University College of Osteopathic Medicine (RVUCOM)*
- Touro College of Osteopathic Medicine – New York (TOUROCOM)*
- Touro University College of Osteopathic Medicine – California (TUCOM-CA)
  - Touro University Nevada College of Osteopathic Medicine – Nevada (Branch) Campus (TUCOM-NV)*
- University of Medicine and Dentistry of New Jersey – School of Osteopathic Medicine (UMDNJ-SOM)
- University of New England College of Osteopathic Medicine (UNECOM)
- University of North Texas Health Science Center/Texas College of Osteopathic Medicine (UNTHSC/TCOM)
- Edward Via Virginia College of Osteopathic Medicine (VCOM)*
- West Virginia School of Osteopathic Medicine (WVSOM)
- Western University of Health Sciences/College of Osteopathic Medicine of the Pacific (WesternU/COMP)

* Founded since 2000

From American Association of Colleges of Osteopathic Medicine[8]

ii Among the newest osteopathic medical colleges is Rocky Vista University College of Osteopathic Medicine in Aurora, Colorado, the first accredited for-profit medical school in the United States since the post-Flexnerian era.

Figure 2
Growth of Osteopathic Medical Colleges/Enrollment (1968 – 2008)



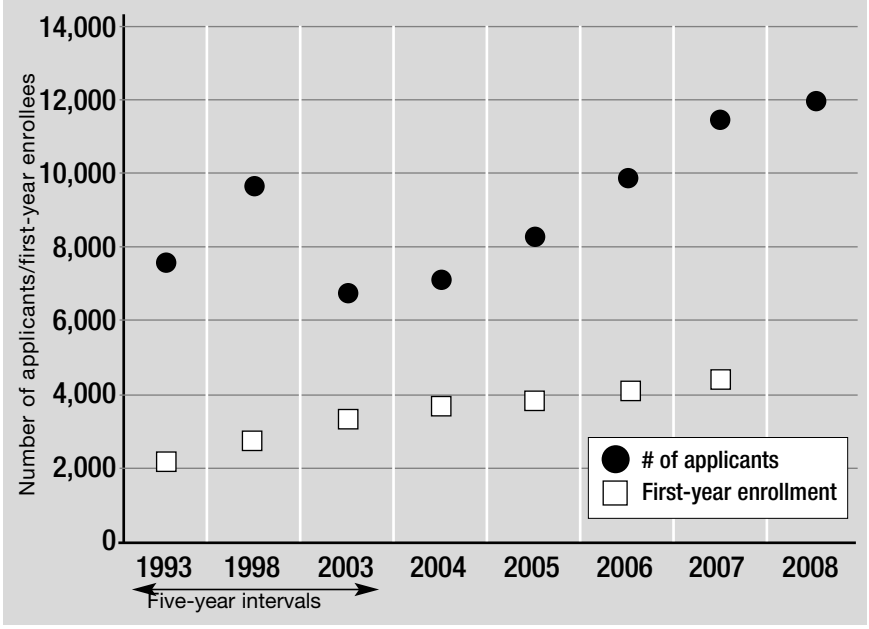
Source: American Association of Colleges of Osteopathic Medicine Office of Research

colleges that might open during that time). Currently, almost one in five medical students attending an accredited medical college in the United States is attending an osteopathic medical school.

The applicant pool for osteopathic medical schools has grown significantly as well. The number of applicants rose from 7,506 in 2003 to 11,859 in 2008—a 58 percent increase ***(Figure 3)***. And, since the mid-1990s, the percentage of female applicants has increased from 37 percent to 50 percent, with a roughly equivalent percentage of women matriculants. During this period, the percentage of underrepresented minority group members (African-American, Hispanic/Latino American, Native American, and Alaska Native) in the applicant pool grew from about 9 percent to more than 15 percent,[iii] although the proportion of minority matriculants only grew to about 12 percent.[8]

iii Comparisons of minority applications and enrollment are problematic because in recent years the question has become a "mark all that apply," and therefore individuals may designate multiple ethnicities and races.

Figure 3
Osteopathic Medical Education Applicants and First-Year Enrollment



Source: American Association of Colleges of Osteopathic Medicine Office of Research

As the applicant pool has grown, matriculant Medical College Admissions Test (MCAT) scores and undergraduate GPAs have also improved. From 1993 to 2007, the mean grade-point averages of entering osteopathic medical students has increased from 3.19 to 3.36 in science courses, and from 3.32 to 3.54 in non-science courses. During the same years, mean MCAT scores rose from 7.7 to 8.8 in biological sciences, 7.4 to 8.2 in physical sciences, and 7.7 to 8.6 in verbal reasoning.[8]

Even as the osteopathic medical schools are planning further growth and new colleges are being developed, significant concerns have been expressed about the capacity to support this growth, especially as it relates to clinical training. In the most recent American Association of Colleges of Osteopathic Medicine (AACOM) Annual Survey of Medical School Deans, of the 13 colleges indicating plans for growth, nine noted the potential of a shortage of clinical training sites. This

same concern was also expressed by half of the colleges that do not plan to grow. Another concern relates to whether sufficient opportunities for graduate medical education are available in desired specialties and geographic locations. The availability of well-qualified faculty—in both basic and clinical sciences—was also cited by several deans as a challenge to the growth of undergraduate osteopathic medical education.[9]

For more than 50 years, osteopathic medical school curricula have closely mirrored those of allopathic schools. The first two years focus on the biomedical and clinical sciences, followed by core clinical training in the clinical specialties. Today's osteopathic medical school accreditation standards require training in internal medicine, obstetrics/gynecology, pediatrics, family practice, surgery, psychiatry, emergency medicine, radiology, preventive medicine, and public health. In addition, most schools provide a rural or underserved-focused primary care experience and allow time for electives as well.[10,11]

Designers of osteopathic medical school curricula have attempted to maintain those core values the early founders stressed as central, distinguishing aspects of osteopathic philosophy: holistic, patient-centered, preventive, and health-focused (as opposed to disease-focused) care within a primary care context, although these elements of osteopathic philosophy have been increasingly prominent in allopathic medical education and practice as well. However, the osteopathic medical school curriculum has been and continues to be clearly distinguished by a focus on osteopathic manipulative medicine (OMM).[iv] This emphasis is particularly true in the first 2 years, when students receive significant (in terms of time and educational focus) instruction in the theory and skills of this aspect of osteopathic diagnosis and treatment in the provision of healthcare. Ongoing OMM training continues in the clinical years, and program requirements in osteopathic graduate medical education (OGME) provide further OMM training.

A number of changes have occurred in recent decades in the academic environment of osteopathic medical schools. Over the

iv Osteopathic manipulative medicine is an aspect of osteopathic medical education that distinguishes it from allopathic (MD) medical education. OMM education usually occurs through year-long first- and second-year theoretical and skills courses and subsequent clinical experiences designed to teach students the underlying principles and techniques needed for diagnosing and treating patients with specific conditions. OMM education is in addition to, and integrated with, medical training on current and emerging theory and methods of medical diagnosis and treatment.

past 40 years, most D.O. schools developed or became a part of larger universities, with other colleges and/or health professional programs, and regional accreditation became the norm. Accreditation standards have been tightened, with a greater emphasis on the evaluation of faculty sufficiency and the clinical training environment. (Accreditation is overseen by the American Osteopathic Association [AOA] Commission on Osteopathic College Accreditation—COCA.) Outcome-based and competency-based curricular standards were implemented, and a requirement that research be included in each school's mission was adopted.[12,13]

The composition of the faculty at osteopathic schools has changed as well. Since 1992 the percentage of faculty members with M.D. degrees has nearly tripled, from 13 percent in 1992 to 38 percent in 2006. The percentage of faculty members with a D.O. degree has decreased by one third (from 67 percent to 44 percent) over the same period.[8]

A variety of curricular innovations have been implemented within the osteopathic colleges. In many schools, problem-based, small-group, and/or individualized learning tracks have replaced or augmented the more traditional lecture-based curriculum. Standardized patients, simulation instruction, and testing have been implemented, as well as competency-based curriculum requirements that mirror those adopted for OGME (osteopathic graduate medical education) programs. Computer-assisted learning and Web-linked instruction have increased in most institutions.[14,15] Increased emphasis on research and evidence-based medicine is also a dominant theme. (A particular focus has been placed on the lack of sufficient research into the biomedical mechanisms and clinical efficacy of OMM, with the establishment of a research center at the University of North Texas Health Science Center College of Osteopathic Medicine in 2002 through funding from the NIH and several osteopathic organizations to foster collaborative research on these issues.[16])

Some particularly innovative curriculum models are being introduced as well. One of the newest schools, A.T. Still University School of Osteopathic Medicine of Arizona, is implementing a primary care focused, community health center based clinical presentation model curriculum. Students disperse to their community health center locations in year two. Another innovative program has been developed

at Lake Erie College of Osteopathic Medicine, where a primary care scholar's pathway enables students to complete medical school and family medicine residency training in 6 years (saving 1 year's tuition).

These two programs speak to a difference that has traditionally existed between osteopathic and most allopathic medical schools—a focus on primary care medicine. Primary care has been a principal organizing theme of the osteopathic medical education curriculum since its early years. The largest number of D.O.s (approximately two thirds) practice in primary care specialties.[17] Most osteopathic medical schools have an explicit statement about their primary care–focused curriculum in their mission statements, vision statements, or statements of philosophy.[18]

Until recently, osteopathic medical education and practice occurred in a system separate from that of allopathic medicine. There were separate osteopathic medical colleges, hospitals, licensing board examinations, and specialty training programs offering certification. Most osteopaths had solo or small-group practices with other D.O.s.

Clinical training within the osteopathic profession at the pre- and post-doctoral level traditionally occurred mostly within osteopathic hospitals that had developed during the twentieth century in locales with significant numbers of D.O.'s. These mostly community-based institutions were the principal sites of clinical training for D.O. students, interns, and residents. However, over the past two decades, regulatory and economic changes in the hospital industry have caused most of these institutions to close or merge into larger, traditionally allopathic institutions. The combined impact of this loss of traditional clinical training venues, the growth in the number of osteopathic colleges and graduates, and the changing healthcare environment have led to significant changes in postgraduate training for D.O. graduates.[19,20]

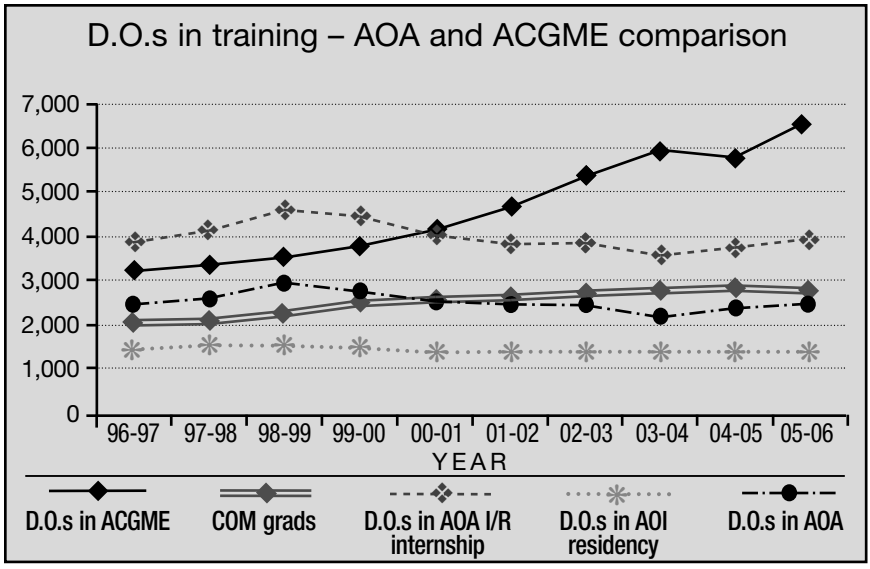
After 1960, osteopathic postgraduate training evolved in a pattern that was separate from but similar to MD training in the United States. A variety of residency and fellowship programs were added to the traditional rotating internship year, enabling D.O. graduates to specialize in practice areas that largely mirrored those of their allopathic counterparts. The AOA had already developed OGME specialty training and certification processes for D.O.s as the profession expanded and

adopted the growing biomedical advances and specialized practice patterns in the late twentieth century. By 2007, 52 AOA-sponsored OGME training programs were in operation, overseen by 23 AOA specialty societies, with 2,989 osteopathic residents.

In the 1990s, the AOA established a consortium system for OGME programs in response to the changes in the hospital environment for clinical education and the desire to link OGME more closely with the osteopathic medical colleges. Starting in 1999, OGME programs were required to be members of an osteopathic postgraduate training institute (OPTI) in order to receive program approval. OPTIs underwent a separate approval process that required the membership of at least one osteopathic medical school and a minimum number of programs and residents within each program. The AOA implemented OPTI inspections for standards in a number of areas, including curriculum, research, faculty, and facilities. Separate approval of specialty programs within each OPTI also was required. Currently, all OGME occurs within 17 existing OPTIs, consisting of 21 osteopathic colleges, 206 hospital partners, and 665 residency programs.[21,22]

For a number of years, osteopathic medical students have pursued

Figure 4
D.O.s and Graduate Medical Education

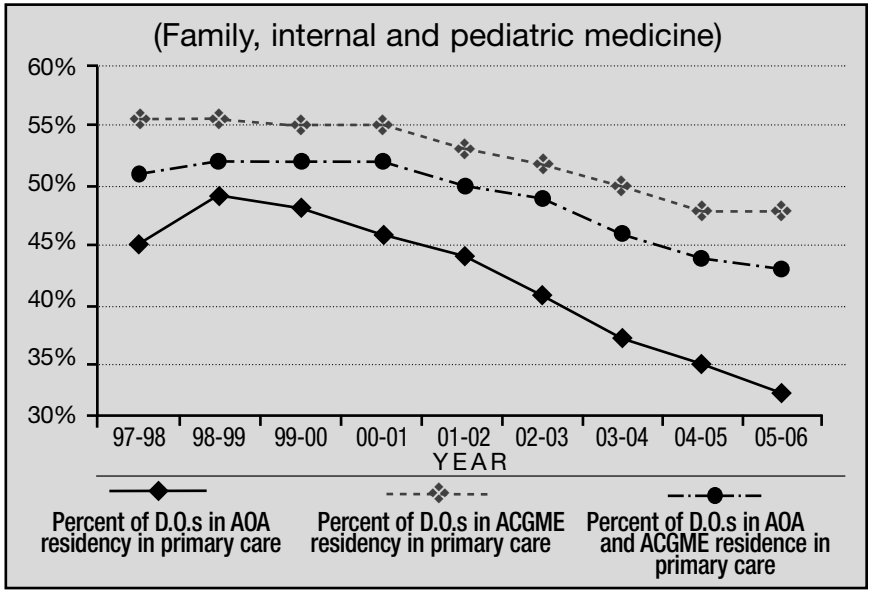


Source: American Ostiopathic Association

one of three pathways to achieve their specialty training: 1) matching into an AOA internship/residency track; 2) matching directly into an ACGME residency program or transitional year; or 3) performing an initial AOA internship year and then matching into an ACGME residency program. Licensing requirements in five states (Pennsylvania, Michigan, Florida, West Virginia, and Oklahoma) require at least one year of AOA-accredited OGME for licensure.

Over the past two decades, the separate clinical training system for D.O.s has changed significantly. Not only has the separate hospital system largely disappeared, but also most D.O. students now receive clinical training alongside MD students in institutions with ACGME training programs. The GME selection preferences of osteopathic graduates have changed as well, with an increasing number of students matching directly into ACGME programs and fewer staying within OGME programs for the entire duration of their specialty training ***(Figure 4)***. In 2007, 60 percent of the 11,140 D.O.s in OGME training were in ACGME residencies and fellowships; only 49 percent of the available OGME residency slots were filled. In addition,

Figure 5
D.O.s in Primary Care Residency Position



increasing numbers of D.O.s are pursuing specialty training in areas other than primary care. Today, about half are selecting primary care residencies as opposed to the historical two thirds ***(Figure 5)***. These trends have led an increasing number of (mostly primary care) OGME programs to obtain dual (90 programs) or parallel (19 programs) approval by both the AOA and ACGME.[21]

The increasing numbers of D.O. graduates selecting ACGME specialty training can be explained by a number of factors:

1. Increased student clinical training in institutions with allopathic training programs

2. Number of D.O. graduates increasing faster than the AOA training program positions

3. Greater desire by D.O. graduates for specialty training in areas other than primary care and fewer options for such training in AOA programs

4. Few or no AOA programs in many states or regions of the country, and personal factors dictating desired locations for postgraduate training

5. Increased numbers of AOA programs either dually approved with their ACGME counterparts, or existing in parallel within the same institutions

6. Loss of the traditional pathway of D.O. graduates with the breakdown of the historically separate training, hospitals, and practice system

7. Perception of lower quality of training in AOA programs by some D.O. graduates

8. Active recruiting of D.O. graduates by many ACGME programs[15,23]

D.O.s can obtain board certification through ABMS or AOA specialty boards. The AOA has modified its board-eligibility requirements to enable most ACGME-trained D.O.s to achieve AOA certification, a requirement for osteopathic directors of medical education, residency training directors, and some academic positions in osteopathic

medical schools. Increasingly, D.O. graduates also are obtaining ABMS certification, and many are going on to practice in larger groups of mixed M.D./D.O. specialty practices and hospital staffs.[24]

These trends, coupled with a growth spurt in the number of osteopathic colleges, raise a number of questions about the place of osteopathic medical education and practice in the coming decades, including the following:[25,26,27,28]

1. Will those aspects of distinctively osteopathic medical education and practice survive increasing integration into allopathic clinical education systems?

2. Will the trend away from primary care training of D.O. graduates continue, and what will be the impact on that tradition in osteopathic education and practice?

3. Are there enough faculty, academic leaders, and clinical education resources to sustain continued growth?

4. What impact will the simultaneous growth of LCME schools and the increasing influx of international medical graduates have on pre- and post-graduate clinical training as competition grows?

5. Finally, what role should osteopathic medical education play in meeting the demand for physicians in the twenty-first century?

Members of the osteopathic medical education and practice community are debating these questions and reassessing old assumptions as they seek to ascertain the place that osteopathic medical education should occupy in the coming decades and seek ways to guide it there.[29]

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Innovation in Medical Education: The SOMA Experience

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Medical education in the United States faces many challenges. This is not a new circumstance for medical education, which has faced numerous challenges over the years. Many reports, commissions, and individuals have questioned various aspects of medical education and suggested changes. To some extent, the medical education community has responded, yet new issues continue to arise..

In order to place this paper in the proper context, the following is a sampling of the challenges currently facing medical education:

— Integration of the basic and clinical sciences

— Relationship between medical education and the practice of medicine

— Diversity in medical education

— Development of a true continuum in medical education

— Cost of medical education

— Incorporation of cognitive science findings into medical education

The School of Osteopathic Medicine in Arizona

This short paper describes a new osteopathic medical school's attempt to meet some of the current challenges in medical education.

The board of the A.T. Still University of Health Sciences, the parent University of the School of Osteopathic Medicine in Arizona (SOMA) first discussed the possibility of a new school in 2003. The board, at that time, was concerned about the need for more physicians in Arizona, where one of its two campuses was located, as well as about the many challenges facing medical education. The Board then decided to establish a new medical school in Arizona and charge it with addressing at least some of these challenges.

The school was initially planned by a small group of individuals

from the school and/or the University who were advised by blue ribbon panels in the areas of medical education, technology, and business. Many hours of planning and discussion ensued before initial accreditation was obtained. The first class was admitted in the Fall of 2007.

The Clinical Presentation Model, which was developed at the University of Calgary (Calgary, Alberta, Canada) Medical School and implemented in 1994, was chosen as the curricular model. This model is based on three categories in which patients present to physicians: signs, symptoms, and abnormal laboratory findings. Researchers have found that patients present in a limited number of ways (120 ± 5), and that number has proven stable in studies by a number of medical schools. In this model, students learn by studying the clinical presentations and the diagnoses associated with the presentations.

SOMA has no individual courses in the sciences basic to the practice of medicine. Instead, students learn the basic sciences as these subjects are bundled with the clinical presentations. It is our feeling that the Clinical Presentation Model, with its bundling of the basic and clinical sciences, leads to more significant integration than other models. Also, students who comprehend the various aspects of each clinical presentation will have few gaps in their medical knowledge. Educational methods employed by SOMA include interactive large-group presentations, in which the learning facilitator ("lecturer" in many medical schools) interacts with students and guides the group in discussion, rather than a more passive "talking at" students. Small group discussions, in which the physician facilitator both guides and participates in the discourse, are a regular feature.

SOMA students spend one year on campus and then continue their studies in groups of ten at large community health centers (CHC) around the United States. One reason for placing students in these centers this early in their training is the finding from cognitive science that students learn best when learning takes place in a context where the knowledge will be used. Students in the CHCs spend approximately 70 percent of their time in academic endeavors and 30 percent in the clinical environment. One full-time physician medical educator employed by SOMA oversees didactic activities at each site using adjunct physician faculty members at each CHC, and distance

education technology and regular site visits by Arizona-based faculty. Third- and fourth-year clinical rotations are done in hospitals affiliated with the CHC. The Clinical Presentation Model also will be used during years three and four, along with the Harvard/Cambridge Integrated Clerkship Model.

The Future

SOMA is now trying to further decrease the number of large group presentations in years one and two, giving preference to facilitated, or guided, small-group discussions. We believe that innovation deserves innovative evaluation, which we are developing. We also continue to search for innovative ways to improve the third and fourth years of medical school, as well as the GME years.

Discussion Highlights

OVERVIEW OF CURRENT EXPANSION

When a policy window opens, it only stays open for a short time and then you have to wait until it opens again. In medical education, it hasn't opened for 25 years, so this is an opportunity to make a difference.

In the expansion of the 60s and 70s, most new schools were focused on community-based medical education. No such focused movement is apparent in the current expansion, though expansion of the biomedical research enterprise seems to figure prominently in the plans of many expanding medical schools and some of the proposed new schools.

The history of osteopathic medical schools as producers of primary care physicians, and as potential producers of more primary care physicians, is driving much of the growth. Seventy-five percent of graduates used to go into primary care. Now the number is closer to 50 percent.

There's a research focus on osteopathic manipulative medicine, to understand the biomedical mechanistic side as well as to determine the clinical efficacy. If you have a modality that is demonstrated to be effective, either in diagnosis or treatment, that modality should be available to everybody. Conversely, if it's demonstrated to be non-effective, it should be discouraged or abandoned. Many schools conduct continuing education courses in manipulative medicine, and often the majority attending the course are allopathic physicians.

From the perspective of LCME, the learning objectives must be accomplished even if the courses and curriculum are different. Part of our challenge is finding out if the education of medical students whose clinical training occurs in conjunction with ACGME programs is different from that of students not trained in those environments, because the difference in cost is dramatic and will have implications for public policy makers and those doing the funding.

The community-based movement and the philosophy behind it was fundamentally different from the model that existed at the time. Only a few new schools today are embracing the community-based model. So, when we talk about the need for more primary care

physicians who are going to serve underserved communities and different health needs, and we're growing in a more traditional model that doesn't produce more primary care docs, where are they going to come from?

Regional medical campuses have been around for about 30 years, but were largely ignored until 2002, when AAMC was asked how many existed. We now know there are at least 75 clinical or basic four-year regional medical campuses and at least 12 more have been proposed. These small campuses view themselves as incubators of educational innovation because of their size, few have any residents, and many focus on the community and use community settings. This is not unimportant because many of them fly under the radar of the main medical campus.

Thoughtful planning often lags behind the actual announcement of the expansion.

The four-year regional campuses that are aspiring to become independent four-year educational programs are very much reminded that they are part of a single college of medicine that happens to be in two locations. When a campus develops its own different identity, you begin to see competition for dollars and for help with fundraising. Separate new schools and campuses are different.

Efforts to find an evidence base for osteopathic manipulative medicine brings to mind the fact that most allopathic medical researchers would agree that a good deal of medicine practiced by allopathic physicians is not evidence based, and that a significant fraction of everything that all physicians do is wasteful and unnecessary, and some of it is harmful.

Given the natural experiment of expansion under way, what does the output look like? Will we change the case mix or the workforce mix from an effectiveness and equity point of view or will it be business as usual?

If you have a policy window and you are a savvy education dean, the open window gives you a chance to do some things you have wanted to do but haven't had the opportunity or the leverage.

All five medical schools in the University of California system are

at some stage of growth, and two non-medical campuses have aspirations and plans for adding medical schools, all within the context of a $16 billion state budget deficit. Concerns about competition and the resource ramifications of growth are something we live with daily.

We currently have 75 students in each class and we're going to 103 (at the University of New Mexico School of Medicine), so we'll still be one of the smaller schools even after expansion. We've admitted three classes to the program that will be part of the expansion: 66 percent of the students we've admitted have been from rural areas and 80 percent are from underrepresented minority groups.

Different reasons exist for schools to expand, but with expansion we are not connecting the dots. In underserved primary care programs, how important is a strong fundamental science base, and does getting that dilute the pool? If you are doing a biomedical program, how important is it to understand the patient? As we move almost into apprenticeships, are we saying we can do it sooner because they don't need those underpinnings or because those campuses are not equipped to do it? Is there value added to this expansion that's going to make it worthwhile for the efficacy, the excellence, and the equity, or are we just making widgets?

Every time I've seen a school expand, the person who's been doing it burns out. They stop fighting to find high quality experiences for their students and shift their mentality from high quality to any place that will take students.

Is the policy window really open and, if so, who is leading? Is planning following behind? Is it driven by an economic model more than a decision about how we (in equitable fashion) address the health needs of the population?

If we have an expectation of rational decision making in higher education, academic medicine, and the political system, there is no existing evidence suggests that they have ever operated in a rational model.

There is a wonderful theory of decision making in higher education called the garbage can model. You put all your solutions in a pot and when a problem comes along, you attach a solution to the

problem and push it through.

The market is in charge here, and that's something we don't pay attention to. Over the past 30 years, there's been an unprecedented growth of the market in all aspects of the healthcare system. We're in a real quandary with focus because how do you focus on need, which we all want to address, as opposed to want, which is what the market responds to?

Is expansion really an opportunity for education leaders to harness the momentum and make change in the curriculum, or is it a threat? Experience has shown that the bigger the class size, the harder it is to innovate and do a good job. If we are going to be optimistic that this is a time of change and an opportunity to train a better doctor, we have to temper that with the reality of whether this particular expansion is an opportunity or actually a threat.

There is a difference between whether you are a pioneer and starting to do something new and innovative because class size is small, and whether you're adding to what's already going on. Rochester was able to take curricular reform further than Harvard, and the single biggest difference was that Rochester had 100 students in a class and Harvard had 150.

I have yet to see a system or institution do an expansion with the end in mind, specifically with a true new kind of delivery system. I haven't seen anybody build expansion around the healthcare team of the future.

As a group we are trying to answer, what is the direction we should take this expansion when right now we live in a time of questions. I think it is great we don't have a focus, because each of the new schools will address something new, and one or two of them will wake us up and we'll start asking questions we're not yet asking.

My motivation for going to this particular university is there is no medical school there, all the practices are small and almost single specialty, and the practice is very fractured. My goal is to get all the practitioners involved and create a delivery system that can be a model. I hesitate to say this because in 10 years, you may all say what a failure. But if you don't say the incredible things, then for sure nothing will happen.

I want us to have more hope than I hear here, and I think it is okay not to have a direction.

The first thing we have to ask is what do we really want to do, and then we get to how do we want to do it and that comes down to economics. In many instances, it is a dirty word, but if you want a primary care physician in a town of 5,000, how are you going to pay because they are not going to go for free.

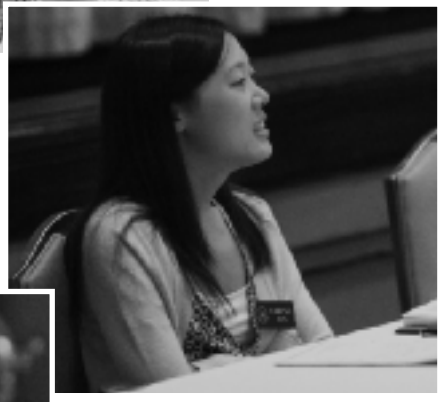
We're not looking for what's the least expensive, most effective team. There's evidence that if you put more physicians in a community, it drives up the costs. We know we can't afford to give the healthcare we can now provide to everybody in the country, but the emphasis is not on looking for cost effective approaches. Instead what's driving the economics is how to make more money and how to make sure primary care physicians make more money.

If you really look at what pushes students into certain areas, part of it is what service had really awesome residents who made you want to go to work in the morning. You can't compare this to the 60s and 70s. We've got a very different group of students now, older, more diverse in terms of experiences, different backgrounds. We're no longer a bunch of mostly white male 22-year-olds going into medical school. We're experienced adult learners who are going to make decisions about specialties, where, and how we practice based on a larger array of things and chaos theory seems to dominate some of it.

Expanding class size may help a community, and it may add to economic development, but until we do things like change the numbers of GME positions, it is fundamentally not going to increase the number of doctors who are caring for patients.

What is truly driving a lot of healthcare costs is personal economics, driven by who is most effective advocating for an increase in their share of the fixed cost that Medicare is paying.

I think we need to be honest about the fact that what is driving some of this expansion is prestige. It's not economics. It's not healthcare. It's not greater attention to disparities, or any other noble purpose. It's a university president who wants a medical school in his purview.



II.

Lessons Learned from Previous Expansion Efforts

Lessons from the Past, Policies for the Future: Medical School Expansion of the 1960s and 1970s

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EXECUTIVE SUMMARY

Amid reports of a pending physician shortage, the United States is facing its second major medical school expansion in over 30 years. The last major expansion occurred in the 1960s and 1970s.

Concerns about a physician shortage began to develop in the mid-20th century with the publication of landmark reports by national commissions as early as the 1950s. Early on, these commissions focused on the shortage of physicians, but soon they began to examine a set of structural problems in the U.S. physician workforce:

— The increasing specialization of medicine and the need to develop programs aimed at expanding the primary care physician workforce;

— The geographic maldistribution of physicians;

— The need for equality of opportunity in medical education for minority groups; and

— The increasing reliance on foreign medical graduates.

As a result of the coordinated efforts of both private and public organizations, the first federal legislation focused on medical education was the Health Professions Educational Assistance Act of 1963, which amended Title VII of the Public Health Service Act. Much like the reports, early versions of this legislation focused on simply expanding the physician workforce by expanding medical schools. However, later iterations created grants aimed at increasing physician supply to underserved areas, promoting primary care, and increasing opportunities for minority physicians. In fact, following the 1976 reauthorization legislation, which declared an end to the physician shortage, these three issues became the primary focus of Title VII.

Title VII programs since that time have shown success and promise in addressing the physician workforce problem. However, funding for these programs has been severely cut since the 1970s, and other federal medical education policies, such as federal funding for graduate medical education and research in medical schools, have slowly eroded the foundation of Title VII.

From the last major medical school expansion, we draw five major conclusions:

1. **Good Policy Requires Good Leadership**—The deliberations and reports of the series of national commissions in the 1950s and 1960s provides a lens for policy makers considering legislation at federal and state levels. This sort of leadership has not been present in recent years and is sorely missing.

2. **Expansion is Easier than Social Mission**—There can be little question that federal and state investments successfully increased medical school output—doubling the number of graduates in 15 years. Programs to produce more primary care graduates, to increase practice in underserved areas, and to increase the enrollment of minority students—three social mission of medical education—have not fared as well due to modest funding that has been diminishing over time and countervailing influences negating the effects of these programs.

3. **More Sticks to Go with the Carrots**—Public financing is intended to achieve a public purpose. However, funding for graduate medical education (GME) through Medicare entails no institutional requirements in regard to regional needs, let alone to social mission factors. GME payments dwarf Title VII funding, and they are a carrot with no stick. Legislated outcome requirements applied to GME funding could do an enormous amount for the social mission factors, and failure to look at outcomes in the context of any proposed reforms will run the risk of current GME funding washing out any effect of new initiatives.

4. **Osteopathy and the Flexnerian Bind**—Flexner's report succeeded in vastly improving the quality of medical education in the United States by binding it to the research university. Allopathic medical schools have not strayed far from the Flexnerian

model and have become increasingly cumbersome institutions. Osteopathy has not tied itself to the research university, however, and has exhibited an agility and ability to grow schools quickly. The instruments and metrics of medical pedagogy are well enough established today that there is simply no evidence that owning a teaching hospital or sponsoring an extensive research program is required to graduate excellent physician clinicians.

5. **Focus on Workforce Intelligence**—The Bureau of Health Manpower was established in 1967. A Division of Manpower Intelligence was created within the Bureau to collect information, perform data analyses, and produce workforce projections. The Division functioned in robust fashion for more than a decade until it was put on a slow starvation budget. However, today's workforce is much more integrated and complicated than it was in 1967. Good data, analytic research, scientific projections, and policy-oriented reports are desperately needed if good decisions are to be made about the smart use of present and future educational resources in medicine and associated professions.

INTRODUCTION

After a quarter century of little change in the size, geography, or funding of the American medical school enterprise, expansion is suddenly topic #1 throughout the country. Long-held predictions about a physician glut have morphed into concerns over an impending shortage. The Association of American Medical Colleges (AAMC) and the Council on Graduate Medical Education (COGME) have both concluded that a physician shortage is pending, that current schools should expand, and that new ones should be opened.[1,2] The AAMC reports that 56 percent of allopathic schools surveyed in 2005 planned to expand (or had expanded since 2001), and five new allopathic schools were scheduled to open between 2006 and 2011.[3] In addition, five new osteopathic schools have opened since 2006.

The last major medical school expansion occurred in the 1960s and 1970s and resulted in a doubling of medical school output by the end of that period. Many issues from that period of expansion—increasing physician specialization, geographic maldistribution, and underrepresentation of minorities in healthcare—are the same issues we face today. However, private, state, and federal efforts

of the 1960s and 1970s laid the groundwork for addressing these problems, and the policy, legislation, and programs that ensued now make up a body of evidence on which to concentrate today's efforts. This report reviews the previous medical school expansion as a context for the debates surrounding the current expansion. We focus on the wisdom gained from this recent history and lessons drawn that are applicable today. We begin with an examination of the growth of medical education from the beginning of the twentieth century.

AMERICAN MEDICAL EDUCATION AT THE TURN OF THE TWENTIETH CENTURY

The first half of the twentieth century saw significant changes in the structure of medical education in the United States. As late as the early twentieth century, many physicians were still being trained in proprietary schools of dubious quality or in apprenticeship settings, with little regulation of the system.[4] Concern existed over this situation, but reform efforts failed to gain traction until 1910, when Abraham Flexner released his landmark report. Between 1908 and 1910, Flexner visited all 147 U.S. and eight Canadian medical schools. The study found "an enormous overproduction of uneducated and ill trained medical practitioners," which he attributed primarily to the large number of poorly run commercial schools.[5]

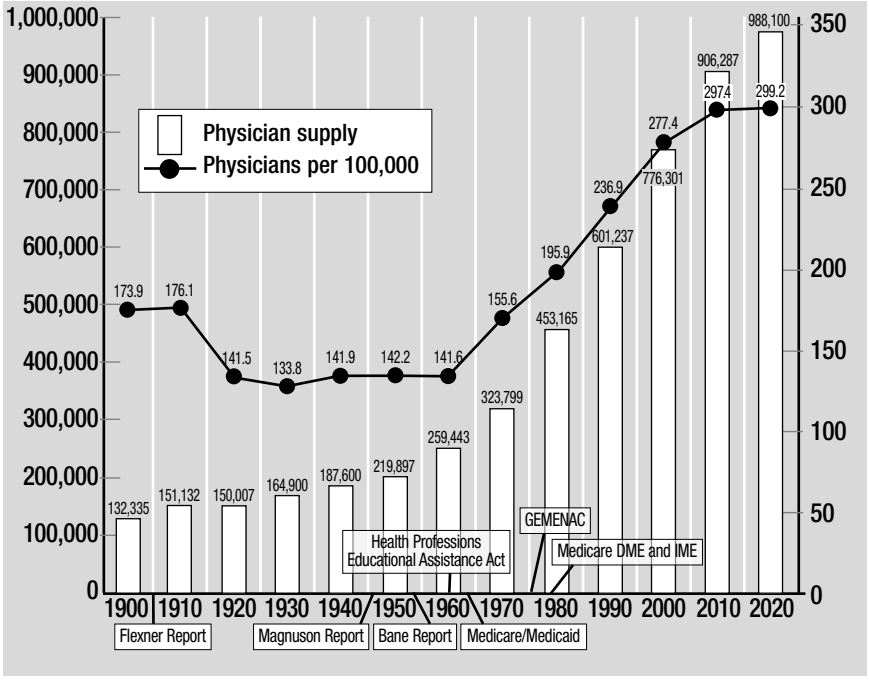
Following the Flexner report, American medical education moved rapidly toward a system of uniform premedical requirements, full-time medical school faculty, and curriculum changes, including more emphasis on laboratory and clinical experiences. Although Flexner is given credit for these reforms, the AAMC and the AMA were also vital to the process. In 1903, the AAMC conducted its first onsite medical school inspection. In 1905, the AMA initiated a list of approved and unapproved medical schools. In 1906 the AMA inspected all schools. Aided by the example of the Flexner report, the AAMC and AMA tightened standards, after which it became more difficult for graduates of unapproved schools to acquire training positions, state licensure, and hospital staff positions. These changes led to closure of virtually all non-university-based medical schools. The number of schools dropped from 147 in 1910 to 76 in 1929. Also, the number of medical graduates fell, and the ratio of

physicians to population dropped from 176 physicians per 100,000 in 1910[6] to 134 per 100,000 in 1930.[7]

Although the Flexner report is best known for its standardization of medical education, Flexner also cemented the future of medical education in ways that have become so embedded that their policy impact over the past century has been largely overlooked. For the best of reasons, Flexner tied medical education to the university system and the growingly complex twentieth century academic medical center. In so doing, however, Flexner limited medical education to the capacity of those increasingly rigid institutions and to those individuals who could meet institutional, academic, and financial requirements.

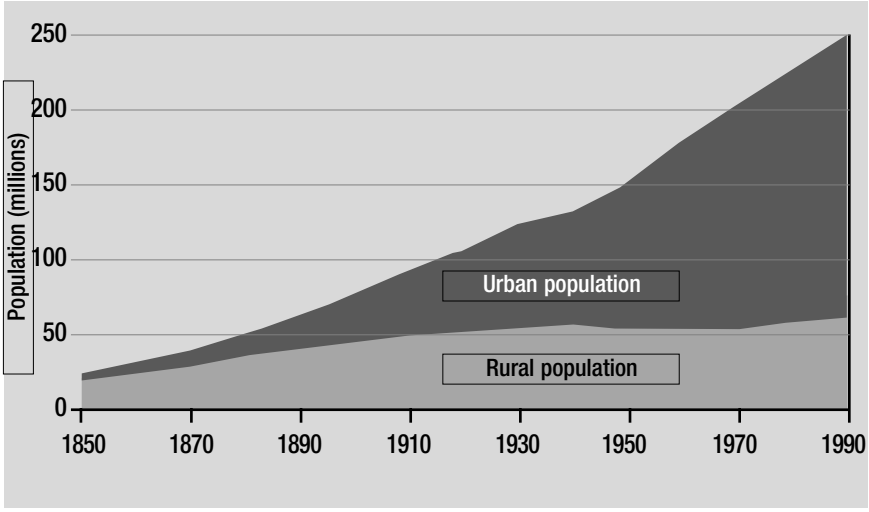
Although the physician-to-population ratio of the country remained steadily in the 140 per 100,000 range from 1920 to 1960, perceptions of physician shortages began to emerge in the 1950s ***(Figure 1)***.

Figure 1
Physician Supply 1900 Projected to 2020



Sources: 1900, 1920,: US Census occupations; 1910: Schofield (1984); 1930, 1940; Stewart WH (1960).
1950-2020: Data provided by the Bureau of Health professions.

Figure 2
U.S. Population – Urban vs. Rural



Data Source: U.S. Census Bureau

This development was less a result of the absolute number of physicians than it was of changes in U.S. demographics and medical practice. The proportion of older Americans was increasing. In 1900, only 4.1 percent of the population was 65 years of age or older. By 1950, that percentage nearly doubled to 8.1 percent. Americans were also accumulating greater expendable income and moving to urban areas ***(Figure 2)***.

At the same time, significant scientific advances were occurring in the field of medicine, and the healthcare system was changing. These developments pushed healthcare toward a more specialized, hospital-based system, and medical specialty practice began to proliferate, with the attendant specialty societies, residency programs, and certification boards. Modern private health insurance began in the 1930s and took off as an employee fringe benefit when wage controls were implemented during World War II. By 1963, 77 percent of the population had hospital insurance, and over half the population had coverage for regular medical expenses.[8] Changes were also occurring in federal legislation. In 1944, President Roosevelt signed the Servicemen's Readjustment Act, better known as the G.I. Bill. This bill allowed physicians returning from World War II to pursue residency training while receiving federal stipends. In 1946, the

Hill-Burton Act provided federal grants for the modernization and construction of hospitals.

While medical specialty associations existed as early as 1864 with the founding of the American Ophthalmological Society, these groups generally had a limited number of members, and were designed primarily for the discussion of research. However, by the early twentieth century, concerns over the educational standards and the skill sets of self-proclaimed specialists began to emerge. The first specialty board, which set standards of graduate education and qualifications for practice, was established in 1917. Residency programs and specialty boards followed quickly. By 1950, 19 of today's 24 American Board of Medical Specialties Member Boards existed.[9]

The first half of the twentieth century saw an evolution in medical education, the demographics of the American population, and healthcare. These changes set the stage for a major medical school expansion in the years that followed. In the 1950s the discussion was professional and policy oriented. By the 1960s the discussion became political and led to legislative action.

THE PUSH FOR EXPANSION

Starting in the 1950s, a number of reports shaped the expansion of medical education to come. The following is a discussion of these key reports.

The Magnuson Commission — 1952

In 1951, President Truman established the President's Commission on the Health Needs of the Nation. He authorized this 15-person commission, chaired by Warren Magnuson, to assess the supply of physicians and the ability of educational institutions to meet prospective requirements.[10]

The creation of the Commission and its subsequent report propelled the physician shortage issue into the public arena. Articles on the Commission appeared in popular magazines like *Time*[11] and in medical and academic journals such as *Pediatrics*[12] and *The American Economic Review*.[13]

The Commission predicted a shortage of at minimum 22,000

physicians by 1960. Their report also highlighted the geographic maldistribution of physicians in the United States, even in 1952:

> It has been suggested by some that the physician shortage is largely a matter of distribution, that it can be solved, for example, by transplanting physicians from well-doctored Manhattan to underdoctored Mississippi. This proposal overlooks a number of important facts. First, our society is not one in which people can be moved about without regard to their own wishes. Second, even in the areas with a relatively better supply of physicians, numerous vacancies exist...Third, we have received impressive evidence that medical students, upon completion of their training, tend to return to the area and kind of community in which they were brought up.

The Bane Report — 1959

Physicians for a Growing America,[14] commissioned by the U.S. Surgeon General, laid out specific recommendations to maintain an adequate physician supply:

— At minimum, the ratio of physicians to population (141) should be maintained by increasing medical school graduates from 7,400 to 11,000 by 1975, a nearly 50 percent increase.

— Existing schools should make every effort to increase enrollment.

— The federal government should appropriate funds to meet construction needs for medical education, including expanding and improving existing schools and construction of new schools and necessary teaching hospitals.

— Private, state and federal action should be taken to establish education loans, grants and scholarships to address the rising costs of medical education.

The Coggeshall Report — 1965

The Coggeshall Report, *Planning For Medical Progress Through Education*,[15] was financed by the Commonwealth Fund to re-examine the role of the AAMC and examine U.S. healthcare trends and their implications for medical education. Two relatively new trends were highlighted in this report. The first was the nation's increasing reliance on foreign medical graduates. The report cites and comments

on a *New York Times* article:

> These young physicians come to the United States by the hundreds because the training here is considered the world's best. They are also drawn because the United States produces too few physicians a year… to fill the needs of the country's hospitals for house staffs.
>
> This situation has consequences not only for the United States but for other nations as well.

The second trend brought forward was the increasing specialization of physicians. In 1965, Coggeshall reported:

> It is clear that the trend toward specialization and its consequences will continue and will increase. It is equally clear that some means will need to be found for providing family physicians—physicians prepared to accept over-all responsibility for their patients' care over extended periods of time.

The Millis and Willard Reports—1966

In 1966, two reports commissioned by the AMA focused on the need for more physicians performing primary care. The authors of *The Graduate Education of Physicians*,[16] also known as the Millis Report, recognized the failure of medical education to produce a "substantial corps" of primary physicians and examined three major reasons:

— Loss of standing for the general practitioner in the medical hierarchy

— The lack of quality educational experiences in family practice

— A view that the conditions and privileges associated with family practice were sub-par to those of specialty medicine.

Meeting the Challenge of Family Practice[17] defined the family physician, spelled out the functions of such physicians, and enumerated the components of an educational program to prepare physicians for family practice. The report identified several deficiencies in medical education including the following:

— Weak programs in preventive medicine and public health

— Lack of instruction in and exposure to family practice

— Clinical teaching revolving around hospital patients, providing little opportunity for physicians in training to experience long-term care of patients in the community

Carnegie Commission Report—1970

In 1970, a publication by the Carnegie Commission on Higher Education entitled *Higher Education and the Nation's Health*[18] placed a responsibility on higher education for the welfare of the nation as it trained skilled health personnel. The Commission issued the following recommendations:

— Expansion of the health training centers by 50 percent over the next decade

— Geographic dispersion of health training centers

— Area health education centers to serve localities without health science centers

— Creation of a National Health Service Corps

— Federal government meeting more of the costs of medical education and states supporting private and public schools

— Ensuring equality of opportunity for women and members of minority groups

The final recommendation reflected a relatively new theme consonant with the civil rights movement that was coming to the forefront of the nation's consciousness. Even in 1970, the Carnegie Commission recognized the importance of training minority physicians:

> The need to train more minority-group physicians and dentists is crucial. They can play a leadership role in stimulating more emphasis on adequate health care services and health education for minority groups, and they can undoubtedly relate to patients of their own races more effectively than white practitioners.

THE STAGE IS SET

These reports set the stage and brought out the issues that would shape the medical school expansion of the 1960s and 1970s. The initial reports not only recognized the changing landscape of health-care and the need for more physicians but also focused attention on

key trends and needs, including the following:

— Increasing specialization of medicine and the need to develop programs aimed at expanding the primary physician workforce

— Geographic maldistribution of physicians

— Need for equality of opportunity in medical education for women and minority groups

— Increasing reliance on foreign medical graduates

The next sections of this report examine the actual expansion of medical schools and the programs and interventions developed to address the issues brought out in these reports.

Expansion

While the bulk of expansion took place in the 1960s and 1970s, the groundwork for medical education expansion was laid in the 1950s as the private sector responded to the need for more physicians. Foundations contributed significantly to existing medical schools. In 1955, the Ford Foundation distributed $90 million to the 82 medical schools then in existence. The Commonwealth Fund provided $13.3 million to 19 private medical schools between 1955 and 1956, and other funding sources, including the Macy, Mellon, and Markle Foundations, increased their support for selected schools. Private sources also contributed to the development of new medical schools. The Commonwealth Fund provided grants to support medical school feasibility studies, and the Kellogg Foundation provided grants for the development of new basic science medical schools.[6]

At the same time, state governments were escalating their efforts to produce high-quality physicians. With the support of the state legislature, the University of California opened its Los Angeles campus in 1951 and planned three additional medical schools. New York organized the State University of New York (SUNY) in 1948, which eventually assumed responsibility for the private medical schools in Brooklyn, Syracuse, and Buffalo. Florida opened its first state-supported medical school in 1956, and Texas and Ohio developed new medical schools in the 1960s and 1970s as part of statewide plans to increase the physician supply.[6]

With the mounting pressure of reported physician shortages and private and state efforts to patch the problem, the federal government stepped onto the stage with the Health Professions Educational Assistance Act of 1963.

The Federal Push

As early as 1949, the federal government introduced legislation to promote medical school expansion. However, this effort and additional attempts made in the 1950s failed, although Congress was able to pass legislation to provide funds for advanced training of nurses and for schools of public health during this time period.

Although concerns over a pending physician shortage increased, the AMA initially held that those concerns were unwarranted. In 1954, the AMA's Medical Economics Bureau studied the problem of geographic maldistribution and concluded that only 361 additional physicians would eliminate the problem. Through editorials and testimony, the AMA actively opposed the 1950s legislation, often citing concerns over a loss of academic freedom if the federal government should intervene in medical education. Some critics suggest that the AMA was in fact attempting to restrict physician supply and thereby maintain physicians' own economic interests.

However, with the reports issued in the late 1950s and the growing sense of urgency over the physician shortage, the AMA began to reverse its stand on federal legislation. In 1960, the AMA testified in support of the construction aid bills in a Congressional hearing.[19]

In 1963, Congress finally passed the first Health Professions Educational Assistance Act (HPEAA), which amended Title VII of the Public Health Service Act. The 1963 Act was limited to providing construction grants for new and existing teaching facilities and student loan funds, but it was the start of federal support for medical education.[20]

The HPEAA of 1965 created basic improvement grants and scholarships specifically for students from low-income families. The basic improvement grants were effectively capitation payments for the expansion of enrollment that continued for the next decade and led to increased class size. The initial law provided a base grant of $12,500 plus $250 for each full-time student as long as schools increased

their enrollment by 2.5 percent or five students, whichever was greater.[21] The Health Manpower Act of 1968 established special project grants for curriculum improvement, educational research, training for new types of health professionals, and assistance for schools in serious financial need.[22]

The National Health Service Corps (NHSC) represents another significant piece of federal legislation emerging in this period to address the issues of primary care, underserved areas, and the cost of medical education. The Emergency Health Personnel Act of 1970 created the NHSC. Amendments to the Act in 1972 established the NHSC Scholarship Training Program and recruitment programs for the Corps within medical schools.

Finally, the Comprehensive Health Manpower Training Act of 1971 transformed Title VII of the Public Health Service Act into the form we know today. Special projects grants were expanded to include programs aimed to improve the distribution of health professionals in underserved areas and to increase the enrollment of students from shortage areas as well as from minority and low-income groups. The Act established the following programs:

— Health Manpower Education Initiative Awards — grants to public, private, and educational organizations for projects to alleviate shortages

— Physician Shortage Area Scholarship Program — scholarships (separate from the NHSC) of up to $5,000 annually for medical students who agreed to practice primary care in a physician shortage area

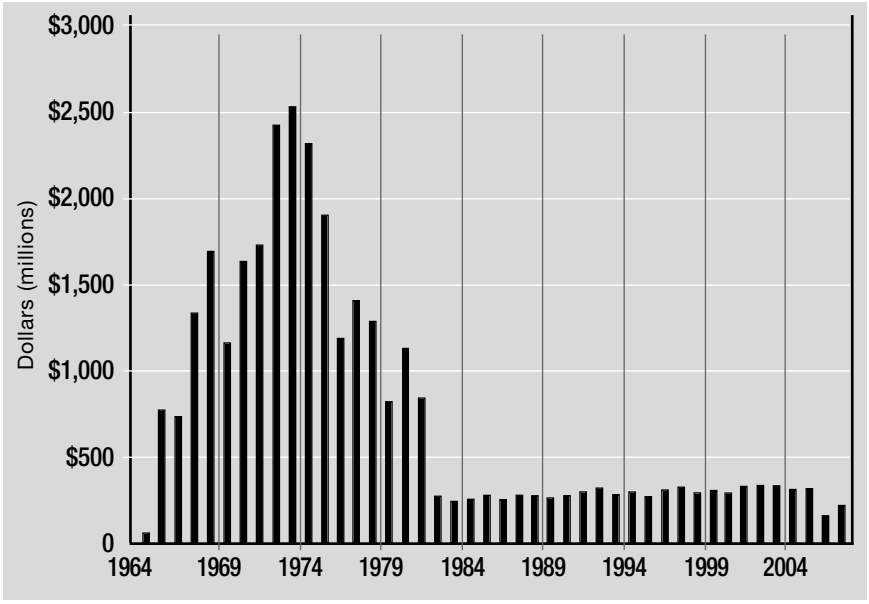
— Grants for training in family medicine

— Grants for postgraduate training in general internal medicine and pediatrics

— National Health Manpower Clearinghouse — to maintain a listing of communities with health professional needs and a corresponding list of health workers interested in working in such communities[23]

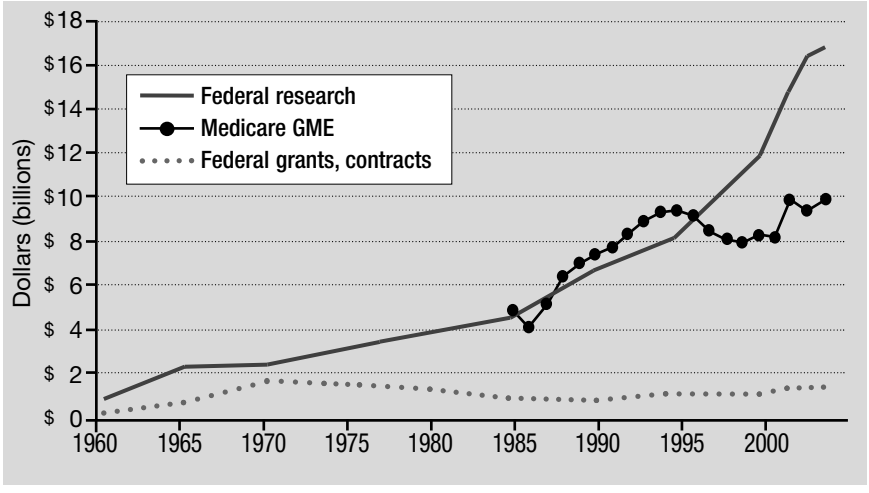
The 1971 Act re-focused federal efforts and dollars onto the issues integral to the physician supply problem — equitable geographic

Figure 3
Title VII Funding, 2006 Dollars



Source: Data provided by Health Resources and Services Administration

Figure 4
U.S. Medical School Revenue, 2008 Dollars



Source: Data provided by Health Resources and Services Administration

distribution of physicians, primary care, and a diverse physician workforce.

However, the next Health Professions Educational Assistance Act, issued in 1976, contained the following declaration: "There is no longer an insufficient number of physicians and surgeons in the United Sates." This Act also reduced authorizations for Title VII programs, reflecting the diminished appropriations for construction, capitation, and special project grants that had occurred in the previous two years ***(Figure 3)***. The 1976 legislation cut funding for the construction and expansion of medical schools by nearly 60 percent over just one year. However, family medicine and postgraduate training grants to promote primary care remained stable over this time period, and the Act established federal funding for Area Health Education Centers.[24] This legislation represented a significant shift in focus for Title VII from simply increasing the total number of U.S. physicians to increasing the number of physicians in primary care, in under-served areas, and from minority groups.

Title VII was inevitably affected by trends in federal funding for other medical education activities. For example, Medicare since its inception has provided funding for GME. In 1983, Medicare converted to a prospective payment system for reimbursement and began making specific and substantial payments to teaching hospitals for costs associated with residency complements of each hospital's choosing. These training patterns were heavily subspecialty in nature and have become more so over the years. Funding from the National Institutes of Health (NIH) has also grown steadily and often dramatically (e.g., doubling in just five years at the end of the twentieth century). These funding streams are large by all measures, and their influence on the values and priorities of medical schools has been profound ***(Figure 4)***. In this funding mix, Title VII programs did not always fare as well as the authors of the legislation might have hoped. We provide further discussion of this funding imbalance later in this paper.

Medical School Expansion

In 1960, 89 of today's medical schools — 84 allopathic and five osteopathic schools — were teaching medical students ***(Table 2)***. Between 1960 and 1979, 50 new allopathic and nine new osteopathic schools were established. These developments represented not only a leap in the number of schools but also a major shift toward public financ-

Table 1
Accredited Medical Schools and M.D. Graduates

Year	Number of schools	Number of M.D. graduates	Year	Number of schools	Number of M.D. graduates	Year	Number of schools	Number of M.D. graduates
1900	160	5,214	1936	77	5,183	1972	108	9,558
1901	160	5,444	1937	77	5,377	1973	112	10,396
1902	160	5,009	1938	77	5,194	1974	114	11,365
1903	160	5,698	1939	77	5,089	1975	114	12,716
1904	160	5,747	1940	77	5,097	1976	114	13,634
1905	160	5,600	1941	77	5,275	1977	116	13,614
1906	162	5,364	1942	77	5,163	1978	122	14,391
1907	159	4,980	1943	76	5,223	1979	125	14,784
1908	151	4,741	1944	77	5,134	1980	126	15,113
1909	140	4,515	1945	77	5,136	1981	126	15,632
1910	131	4,440	1946	77	5,826	1982	126	16,012
1911	122	4,273	1947	77	6,389	1983	127	15,802
1912	118	4,483	1948	77	5,543	1984	127	16,343
1913	107	3,981	1949	78	5,094	1985	127	16,318
1914	102	3,594	1950	79	5,553	1986	127	16,117
1915	96	3,536	1951	79	6,135	1987	127	15,830
1916	95	3,518	1952	79	6,080	1988	127	15,919
1917	96	3,379	1953	79	6,668	1989	127	15,630
1918	90	2,670	1954	80	6,861	1990	127	15,398
1919	85	2,656	1955	81	6,977	1991	126	15,427
1920	85	3,047	1956	82	6,845	1992	126	15,356
1921	83	3,191	1957	85	6,796	1993	126	15,474
1922	81	2,529	1958	85	6,861	1994	126	15,504
1923	80	3,120	1959	83	6,860	1995	125	15,883
1924	79	3,562	1960	85	7,081	1996	125	15,886
1925	80	3,974	1961	86	6,994	1997	125	15,890
1926	79	3,962	1962	86	7,168	1998	125	15,958
1927	80	4,035	1963	87	7,265	1999	125	16,003
1928	80	4,262	1964	88	7,336	2000	125	15,718
1929	76	4,446	1965	89	7,409	2001	125	15,796
1930	76	4,656	1966	89	7,574	2002	125	15,680
1931	76	4,735	1967	92	7,743	2003	126	15,540
1932	76	4,936	1968	95	7,973	2004	125	15,830
1933	77	4,895	1969	99	8,059	2005	125	15,764
1934	77	5,035	1970	101	8,367	2006	125	15,925
1935	77	5,101	1971	103	8,974	2007		16,139

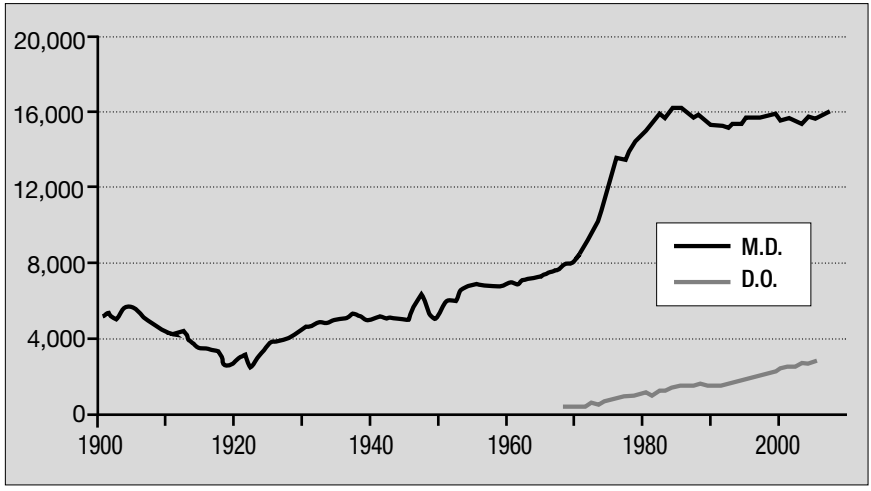
Source: AAMC Data Book 2007 (1929-2007) and Schofield, 1984 (1900-1928)

Table 2
Accredited Osteopathic Medical Schools and Graduates

Year	Number of schools	Number of D.O. grads	Year	Number of schools	Number of D.O. grads	Year	Number of schools	Number of D.O. grads
1968	5	427	1981	15	1017	1994	16	1843
1969	5	432	1982	15	1317	1995	16	1932
1970	6	472	1983	15	1287	1996	17	2009
1971	7	485	1984	15	1476	1997	19	2096
1972	7	649	1985	15	1560	1998	19	2169
1973	7	594	1986	15	1593	1999	19	2279
1974	9	702	1987	15	1572	2000	19	2510
1975	9	809	1988	15	1609	2001	19	2536
1976	11	908	1989	15	1529	2002	19	2607
1977	12	971	1990	15	1534	2003	20	2713
1978	14	1004	1991	15	1532	2004	20	2756
1979	14	1059	1992	15	1606	2005	20	2849
1980	14	1151	1993	16	1752			

Source: AACOM Annual Statistical Report on Osteopathic Medical Education, 2006

Figure 5
M.D. Graduates per Year



Source: AAMC Data Book 2007 (M.D. Grads 1929-2007), Schofield, 1984 (M.D. Grads 1900-1928, AACOM Annual Statistical Report (D.O. Grads 1968-2005)

ing of medical education. Prior to 1960, 46 of the 89 schools (51 percent) were private institutions. Of the 59 schools opened in the 1960s and 1970s, 49 were public institutions (83 percent). From 1960 to 1980, the annual state investment in allopathic medical schools increased from $74 million to $1.5 billion.[25] Adjusted for inflation,

Table 3
Evidence-Based Rural Education Programs

Program	Medical school	Year started	Study outcomes program graduates in rural communities, % (pop < 50,000)
Rural Physician Associate Program	University of Minnesota Medical School	1971	79%
University of Minnesota Medical School, Duluth	University of Minnesota Medical School, Duluth	1972	62%
Upper Peninsula Program	Michigan State University College of Human Medicine	1974	50%
Physician Shortage Area Program	Jefferson Medical College, Thomas Jefferson University	1974	76%
Rural Medical Education Program	Sate University of New York, Upstate Medical University	1989	26%
Rural Medical Education Program	University of Illinois College of Medicine at Rockford	1993	92% (rural not defined)

Source: AACOM Annual Statistical Report on Osteopathic Medical Education, 2006

Table 4
AAMC Community-Based Medical Schools

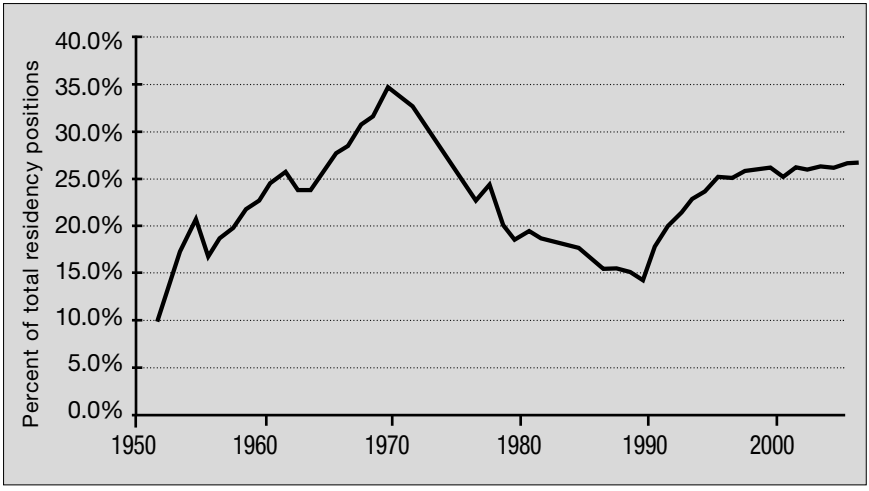
Medical School	Year founded	Full accreditation*	City, State
University of North Dakota	1905	1976	Grand Forks, ND
University of South Dakota – Sanford	1907	1977	Sioux Falls, SD
Michigan State University	1966	1972	East Lansing, MI
University of Hawaii – Burns	1967	1975	Honolulu, HI
University of Nevada	1971	1980	Reno, NV
Texas Tech University	1972	1974	Lubbock, TX
Eastern Virginia Medical School	1973	1976	Norfolk, VA
Southern Illinois University	1973	1976	Springfield, IL
Wright State University	1976	1980	Dayton, OH
Northeastern Ohio University	1977	1981	Rootstown, OH
University of South Carolina	1977	1981	Columbia, SC
Marshall University – Edwards	1978	1981	Huntington, WV
Ponce	1978	1981	Ponce, PR
East Tennessee State University	1979	1982	Johnson City, TN
Morehouse College	1979	1985	Atlanta, GA
Universidad Central Del Caribe	1979	1983	Bayamon, PR
Mercer University	1982	1986	Macon, GA
Florida State University	2001	2005	Tallahassee, FL

* Full accreditation correlates with graduation of a school's 4 year program charter class
Source: Provided by the AAMC

state funding increased more than sevenfold, while federal appropriations for medical education rose and then fell.

Public funding (federal and state) for all schools was a huge factor in the growth of medical education between 1960 and 1980. This investment paid off, more than doubling the number of medical and

Figure 6
Residency Positions Filled by International Medical Graduates



Source: JAMA Annual Graduate Medical Education data, Srptember 1980-2007 (1977-2007) and Schofield, 1984 (1951-1976)

osteopathic students graduated annually between 1965 and 1980. ***(Figure 5, Tables 3 and 4)***.

However, the rapid growth in medical graduates raised a concern about a possible "overshoot" in medical school expansion. Based on language accompanying the 1976 legislation, the Secretary of the U.S. Department of Health, Education and Welfare established the Graduate Medical Education National Advisory Commission (GMENAC) to look at the future of the physician supply ***(Table 1)***. In 1980, GMENAC concluded that an excess of 70,000 physicians would exist by 1990 and an excess of 145,000 by the year 2000.[26] Although the GMENAC findings did not lead to a roll-back of enrollments, the Commission's report sent a chill through the allopathic medical education community that provided the principal rationale for a no-growth collective mentality that lasted 25 years. Osteopathic medical education leadership was less persuaded by GMENAC and continued to add schools slowly during this period.

Although allopathic medical school output essentially froze at 1980 levels, the country's physician supply has continued to increase steadily. One reason for the steady expansion of the physician workforce during this period is the extended time required for the earlier expansion of medical schools to be fully reflected in the

practice sector. The influx of international medical graduates (IMG) means that a direct correlation cannot be drawn between U.S. medical student graduates and the total physician workforce numbers. This is the case because IMGs enter the workforce in residency and, with a few exceptions, remain to practice in the United States. IMG residency percentages have varied over the years but have been substantial and remain so today ***(Figure 6)***. The physician glut foreseen by GMENAC never materialized, and, at the current graduation levels of U.S. medical students and importation of IMG residents, the physician-to-population ratio in the United States will level shortly and then begin to decline ***(Figure 1)***. The reasons for the non-occurrence of a physician shortage are discussed at length elsewhere[27-29] and are the genesis of the current medical school expansion activity.

Emerging Programs and Policies Affecting the Physician Workforce

The principal focus of the early HPEAA legislation was the stimulation of more medical graduates to counter the perceived doctor shortage. Other commentaries from that time the time,[30] as well as the Coggeshall, Millis, Willard, and the Carnegie Commission reports, looked beyond the numbers and pointed to more specific structural problems with the physician workforce. These discussions addressed aspects of what might be called the social mission of medical education:

— The increasing specialization of medicine and the need to develop programs aimed at expanding the primary physician workforce

— The geographic maldistribution of physicians

— The need for equality of opportunity in medical education for women and minority groups

— The increasing reliance on foreign medical graduates.

These issues won legislative action and funding with the 1970 Emergency Health Personnel Act (the National Health Service Corps) and the 1971, 1972, and 1976 iterations of the HPEAA. As Title VII funding for medical school expansion peaked, these specific missions gained funding and, in time, replaced growth *per se* as the *raison d'être* for Title VII. While the level of support has receded,

these missions have endured for 25 years and have had important effects on medical education. Title VII programs were also accompanied by a variety of related federal and non-federal initiatives that affected medical schools. In the following sections we discuss these innovative programs.

Title VII of the Public Health Service Act

Since 1971, Title VII has provided funding for a variety of programs in three educational domains; 1) primary care medicine; 2) underserved area educational opportunities; and 3) support programs for minority and disadvantaged students.

Primary Care Medicine

The 1971 HPEAA reauthorization legislation specifically created grants for training in family medicine and primary care. Grants have included support for medical school education programs, departmental support and faculty development in family medicine, general internal medicine, and general pediatrics. Evidence suggests that Title VII was important in the establishment of medical school and residency training programs in primary care.[31] And while limited, additional research shows that exposure to Title VII programs has been successful in increasing the number of primary care graduates.[32]

Underserved Areas Programs

Title VII has sponsored the Health Education Training Centers program and the Rural Interdisciplinary Training program, but the centerpiece of the underserved training initiatives has been the Area Health Education Centers (AHEC). The 1976 HPEAA reauthorization first authorized AHECs as academic-community partnerships to train healthcare providers in community settings. Their mission has been to improve the supply, distribution, diversity, and quality of the healthcare workforce. Although most AHECs are rural, urban AHECs have been initiated in such locations as New York and Washington, DC. AHEC programs include K-12 health career enhancement and recruitment programs; community training programs for medical students and residents; and continuing education for physicians in practice to increase retention in underserved areas. In 2007, there were 53 AHEC programs and 221 affiliated AHEC Centers in 45 states and the District of Columbia.[33]

Title VII has also provided funding for rural education programs, many of which are successfully placing significant numbers of graduates into rural practices.

In his systematic review of medical school programs to increase the rural physician supply, Rabinowitz suggests that, if all medical schools had similar programs and succeeded in graduating ten students per class, the outcome would double the projected number of rural physicians.[34]

Minority and Disadvantaged Programs

In 1964, the Civil Rights Act barred discrimination based on race, color, religion, or national origin. Title VI of that Act specifically barred the use of federal funds for segregated programs and schools. Medicare legislation mandated that the anti-discrimination protections of Title VI also apply to hospitals receiving public funds.

The HPEAA represent the first federal legislation to address the under-representation of minorities in the health professions. The 1971 reauthorization expanded special project grants to include funding designated for programs to increase the enrollment of minority students. The 1976 legislation established the Health Careers Opportunity Program (HCOP), with the following objectives:

— Identification and recruitment of persons from disadvantaged backgrounds for health professions education

— Facilitation of entry of these persons into health professions school

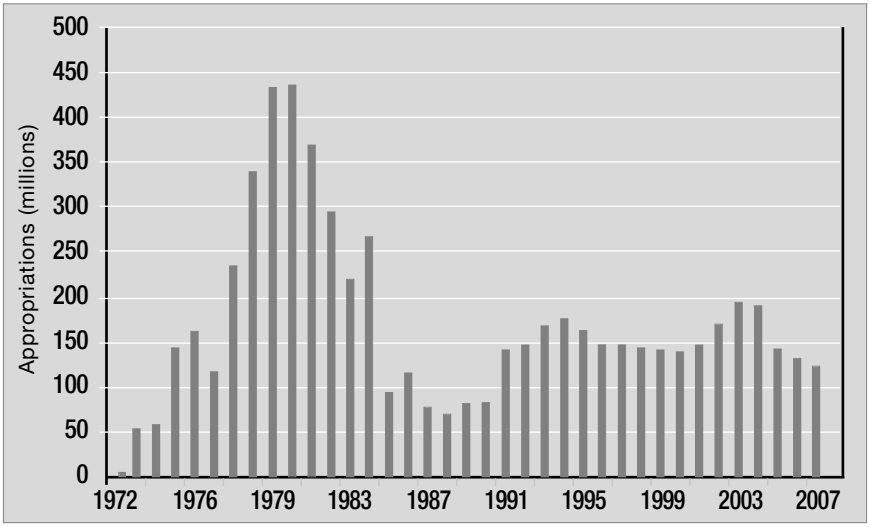
— Provision of counseling or other services designed to help them successfully complete their education

— Provision of preliminary education to help them complete the health professions education

— Publicizing existing sources of financial aid available to students

Today, HCOP is housed under the Bureau of Health Professions' Division of Health Professions Diversity along with two other programs: Centers of Excellence, established in 1991, to improve health professions training for underrepresented minorities; and the

Figure 7 **NHSC Appropriations (2007 constant dollars)**



Source: Data provided by NHSC

Minority Faculty Fellowship Program, established in 2003, to increase the number of minority faculty in schools.

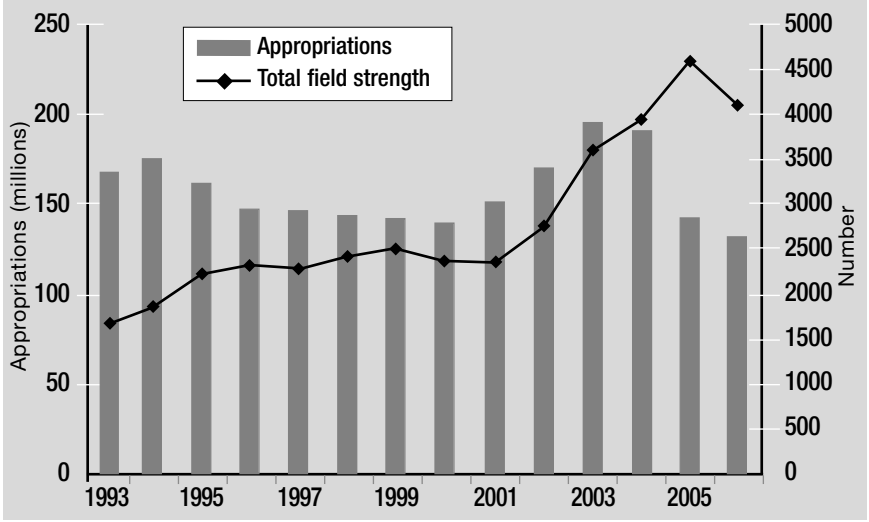
Title VII has also promoted diversity in medical education through additional grants. Title VII scholarship programs have provided financial assistance for disadvantaged students since 1965. Title VII Financial Distress Grants helped to maintain Meharry Medical College in Nashville, one of the few historically black universities with health professions programs. Meharry was one of nine schools to receive a Financial Distress Grant in the 1970s.[35]

Despite the successes of these programs, funding for Title VII has been cut repeatedly since the mid-1970s, and the program is currently on the brink of extinction ***(Figure 3)***.

National Health Service Corps

The National Health Service Corps (NHSC) represents another significant piece of federal legislation to address the social issues of medical education by assisting students and schools with scholarships for individuals willing to commit to primary care practice in underserved

Figure 8 **NHSC Field Strength Appropriations (2007 constant dollars)**



Source: Data provided by NHSC

areas. The NHSC enjoyed early political support but was severely cut during the Reagan Administration, only to be "revitalized" under George H. W. Bush with a long period of relatively flat budgets since that time ***(Figure 7)***. NHSC is an important program but, given the extent of need, it is limited in reach ***(Figure 8)***. The NHSC lists 1722 physicians on duty but posted 2734 physician vacancies in shortage areas.[36] Nonetheless, the links among educational costs, community service, and national policy have proved effective and enduring, and these linkages could easily be expanded.

Community-Based Medical Schools

Community-based medical schools that emphasize community experience as opposed to hospital-focused training are a legacy of the expansion period of the 1960s and 1970s. The AAMC website defines community-based medical schools based on three criteria: 1) schools that do not have integrated teaching hospitals and consequently rely on community hospitals for teaching; 2) schools accredited after 1975; and 3) non-federal schools. The AAMC currently recognizes 18 community-based medical schools, 14 of which were founded in the 1960-70s period. Virtually all are state-funded public schools.

Title VII funds were vital to the founding of many of these schools, most of which are based in rural areas and emphasize primary care in their curricula.

Osteopathic Schools

The growth of osteopathic medical schools deserves special attention in the annals of expansion. In 1960, osteopathy was a minor and historically embattled footnote to American medicine. Only five osteopathic schools existed at the time. Osteopathy was rural, Midwestern, and focused on general practice. These characteristics positioned osteopathy to take maximum advantage of state legislative interest in new medical schools and in Title VII, with its growing emphasis on the same issues. Concerns about physician oversupply did not slow the osteopathic momentum. Osteopathic medical schools more than doubled in number between 1960 and 1980, increasing from five schools to 14. Osteopathic schools generally have minimal research portfolios and do not own or manage hospitals, making them principally teaching institutions. As such they have proven agile and able to grow more rapidly than their more complex allopathic counterparts, a lesson that needs serious consideration in the contemporary environment. Additionally, osteopathic graduates disproportionately enter primary care fields, although recent trends among osteopaths have mirrored those among allopaths, favoring specialty training ***(Figure 9)***.

Shortened Curricula

Another innovation that developed in the 1960-70s expansion was combined baccalaureate/M.D. programs, many of which attempted to shorten the length of time and amount of money it took to graduate a physician. The Sophie Davis School of Biomedical Education at the City College of New York is a particularly innovative example of this movement. The program, opened in 1973, offers a seven-year B.S./M.D. designed to address issues of primary care, underserved areas, and minority recruitment. The first five years are completed at the Sophie Davis campus and the final two clinical years in one of a number of collaborating regional medical schools that ultimately award the medical degree. Sophie Davis selectively recruits disadvantaged students who express a definite interest in medicine and evaluates these students on their actual performance in medical studies. Primary care is a major mission of the school, and the New

York State Legislature requires two years of primary care service in a medically underserved community as compensation for state support received by students in the program.[37]

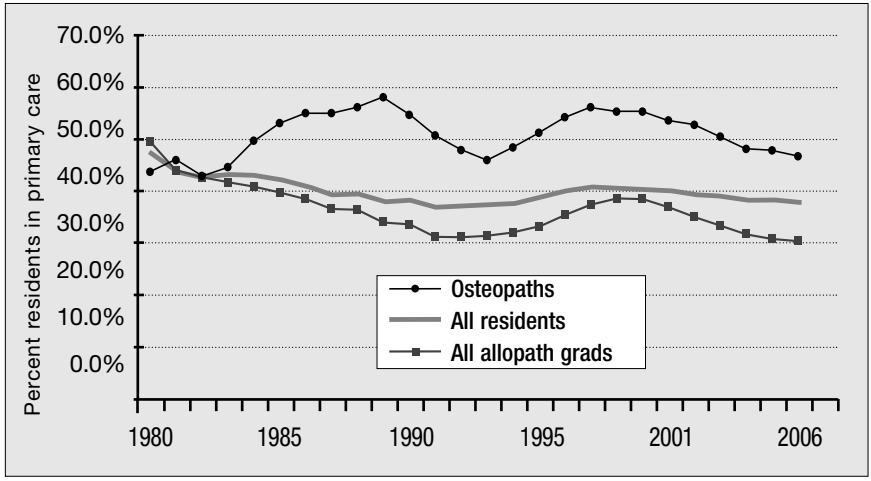
The University of Missouri-Kansas City (UMKC) is a more traditional school that also offers a shortened curriculum. Opened in 1971 to address the physician shortage in western Missouri, UMKC uses a six-year curriculum admitting students directly from high school.[38] The six-year curriculum recognizes a problem that first gained attention in the 1960 and 1970s and has been growing since that time—the barrier presented by the cost of medical education and the increasing amounts of student debt. Thirty-seven allopathic medical schools now offer a combined baccalaureate/M.D. option.[39]

Underrepresented Minorities

Underrepresented minorities, as a percentage of medical graduates and in comparison to their presence in the U.S. population, showed significant gains in the early part of the expansion period, followed by much slower progress. One new minority medical school (Morehouse) and new minority dedicated programs (such as Charles Drew University of Medicine and Science) opened in the 1970s, and many medical faculties, often assisted by Title VII funding, initiated programs of minority recruitment and retention. The AAMC ran a program in the late 1990s entitled "3000 by 2000"—meaning that medical schools should admit 3000 minority students annually by the year 2000. However, the schools succeeded in enrolling only 2000 minority students in 2000 and have failed to reach that number again ***(Figure 10).*** Many causes contributed to the stalling out of earlier efforts to reach numeric parity for minorities in medical education, of which pipeline "insufficiency," costs, and competitive opportunities are three consensus reasons.

Legal challenges have also been mounted to affirmative action in medical education. In the 1978 Bakke case, the U.S. Supreme Court found that, while admission preferences based solely on race constituted discrimination, colleges were legally justified in taking race into account for the purpose of improving the delivery of healthcare services to underserved communities or for the attainment of a diverse student body. In 2003, the Supreme Court upheld the Bakke ruling in a case involving challenges to the University of Michigan's admission policies.[40]

Figure 9
Residents in Primary Care*



Source: JAMA Annual Graduate Medical Education data, Srptember 1980-2007
• Primary Care — Family Medicine, Internal Medicine, Pediatrics,
• "All Residents" category includes IMGs
• Actual percent entering primary care practice will be lower due to subsequent sub-specialty training

The gains won in equal opportunity in medical education during this expansion period were important, but only sufficient to achieve what might be called "half parity"— representation of underrepresented minorities in medical education and half the rate of their presence in the population of the country. Educational, legal, and financial challenges remain, but the successes of earlier years suggest that more can be accomplished.

CONCLUSIONS

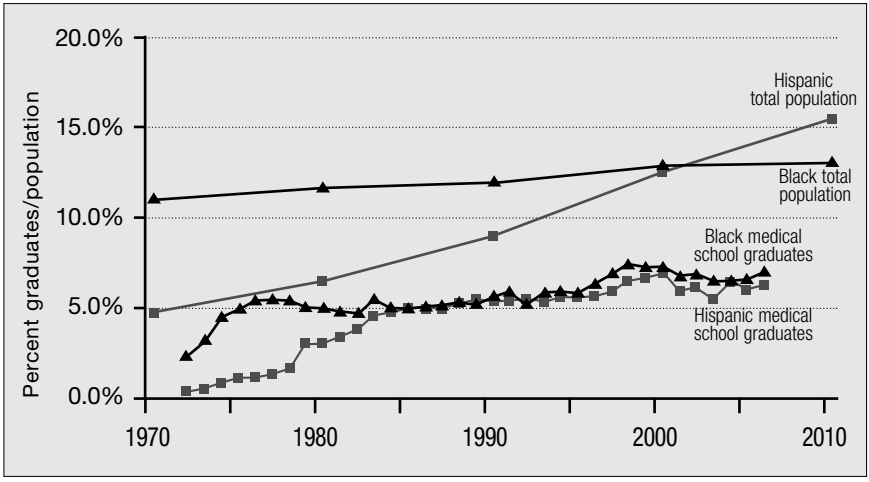
The medical school expansion period from 1960 to 1980 successfully increased the nation's physician supply and set in place legislation to address deficits in medical education in the areas of primary care, physician distribution, and the underrepresentation of minority and disadvantaged students. Public policy attention and political consensus led to the enactment of the Health Profession Education Assistance Act of 1963, which, through serial reauthorizations and amendments, had by 1976 assumed the basic form of the Title VII legislation that has endured for 30 years to the present. Federal funding served as a springboard for the expansion of existing schools, the creation of new schools, and the development of innovative programs to address the key educational issues related to physician supply. State funding

and private philanthropies also contributed to the expansion. The coordinated efforts of all these groups led to the successful expansion of medical schools and to support programs for primary care, underserved areas, and minority students.

What does this history have to tell us about the physician workforce today? Predictions of physician shortages are once again being voiced. Graduating medical students are opting for primary care careers at all-time low rates. Rural communities and federally funded community health centers report severe challenges in physician recruitment. The increase in minority medical school admissions of earlier years has stalled out.

At the same time, federal support to medical schools and teaching hospitals is radically different from what it was in the 1960s and 1970s. Title VII funding has virtually been eliminated, and at the same time the annual federal funding for Medicare GME has grown to more than $8 billion. The NIH budget (much of which goes to medical schools) is at $29 billion annually.[41] The federal commitment to the social mission of medical education has virtually evaporated at the same time that funding for biomedical innovation and specialty residency programs has grown enormously. This is the current

Figure 10
Minority Medical School Graduates Compared to U.S. Population



Source: Medical School Graduate Data: AAMC Data Book, 2007; Population Data: US Census Bureau

public policy reality expressed in budgetary muscle. These are the circumstances as the nation once again engages with the question of medical school expansion and the possibility of new healthcare reform initiatives with a new administration.

What, then, are the lessons of the earlier expansion period that might inform the emerging one?

1. Good Policy Requires Good Leadership—The deliberations and reports of the series of national commissions convened by the federal government, health philanthropies, and professional organizations in the 1950s and 1960s provide a lens for policy makers considering legislation at federal and state levels. This sort of leadership has not been present in recent years and is sorely missing. Foundations have the latitude and nimbleness to move quickly in this area but, by and large, have not done so. The voices of Congress and the executive branch have been unfortunately quiet on the social mission issues. The issues are not simple, but public leadership is crucial if reform is to take place.

2. Expansion is Easier than Social Mission—There can be little question that the federal and state investments in medical school construction, faculty development, student scholarships and loans, and capitation generated a brisk and sustained response. The national medical education enterprise doubled its output in 15 years. The incentive programs to produce more primary care graduates, more practice in underserved areas, and more minority students—three important social missions of medical education—have not fared as well. The reasons for this are also quite clear. Social mission funding has always been modest in comparison to expansion money and has diminished over time. Additionally, the very institutions tasked with addressing these social mission have received large and increasing federal support to train students for other missions, namely research and specialty practice. Any strategy to invest in the still unmet social missions of medical education must take into account the countervailing influences already at play.

3. More Sticks to Go with the Carrots—Public financing is intended to achieve a public purpose. Good legislation envisions outcomes that can be evaluated or measured in some explicit fashion. In fairness, the social mission portion of Title VII was not designed with

targets for its various programs, and as these programs became smaller and more insular over the years of diminishing funding, they became more difficult to evaluate in terms of policy benchmarks. The OMB and Congressional critics have used the inability of the programs to produce clear outcome measures as a reason to call for their elimination—with increasing success. However, the entitlement nature of the enormous quantities of Medicare GME money that have been sent to teaching hospitals from 1983 to the present stands in sharp and ironic contrast to the Congressional calls for "accountability" from the tiny (by comparison) Title VII programs. The Medicare GME payments have no institutional requirements that reflect regional needs, let alone social mission. GME payments dwarf Title VII funding, and they are a carrot with no stick. Legislated outcome requirements applied to GME could contribute an enormous amount for the social mission factors, and failure to do so in the context of any proposed reforms will run the risk of current GME funding washing out any effect of new initiatives.

4. **Osteopathy and the Flexnerian Bind**—As discussed in the previous text, Flexner's report succeeded in vastly improving the quality of medical education in the United States by binding it to the research university. This circumstance has shaped medical education in a way that has proved enduring but, arguably, limiting. Allopathic medical schools have not strayed far from the Flexnerian model and have become increasingly cumbersome institutions. Community-based schools founded in the 1960s and 1970s departed from the norm, as have a few schools experimenting with shortened or combined curricula. Osteopathy has not tied itself to the research university, however, and has exhibited an agility and ability to grow schools quickly, focusing almost exclusively on the teaching function of medical schools. While that might have been a risky business in Flexner's time, the instruments and metrics of medical pedagogy are well enough established today that there is simply no proof that owning a teaching hospital or sponsoring an extensive research program is required to graduate excellent physician clinicians. This observation should be examined carefully by those considering new medical education enterprises in any location.

5. **Workforce Intelligence**—In 1967, as new funding for medical education ramped up and the number of medical students and schools began to grow, the administrative home for the programs, the

United States Public Health Service, reorganized, establishing the Bureau of Health Manpower at the NIH. A Division of Physician Manpower was created within the Bureau to collect information, perform data analyses and workforce projections, and publish reports that would allow policy makers and the public to track developments in this rapidly emerging field. The Division functioned in robust fashion for more than a decade until it was put on a slow starvation budget. Today, less than $1 million annually is spent on workforce tracking activities under Title VII. More egregious than the relative blindness with which policy makers in the physician workforce area now deal is the fact that the workforce is much more integrated and complicated than it was in 1967. Nurse practitioners, physician assistants, and others work in the domain that was then called "the practice of medicine," which invites more nuanced analyses of present and future trends and integrated planning. Good data, analytic research, scientific projections, and policy-oriented reports are desperately needed if good decisions are to be made about the use of present and future educational resources in medicine and related professions.

We face a new period of U.S. medical school expansion. History suggests that this is a time of opportunity during which attention, policies, and dollars might be focused on issues that traditionally have troubled the physician workforce—a balanced supply of physicians including a strong primary care workforce, promoting a good geographic distribution of physicians, and the equitable recruitment of minorities into medicine. State and federal funds devoted to medical education represent a significant public investment. The wisdom gleaned from the expansion epoch of the twentieth century should be used to inform us as we consider similar issues in the twenty-first century.

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University of California Expansion Plans and Rationale

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I was asked to talk about the University of California experience, or rather experiences, and the lessons that we are learning, not all of them easy. The University of California is a public institution, so I'd like to begin by describing the demographic context within which we operate.

California is the largest and most racially and ethnically diverse state in the nation. We have a population of roughly 37 million, and are expected to grow at about double the national average to a total of roughly 42 million by the year 2020. Those over the age of 65 will be the fastest growing segment and, according to our California Department of Education, 200 languages are spoken in our public schools, with 43 percent of Californians indicating that they speak a language other than English at home. These are practical realities in terms of education and training in both rural and urban sites.

We are slated to become even more diverse by the year 2020, with projections that the Spanish-speaking Latino population will grow by an estimated 65 percent, and will become the majority group within the state at the same time that the white English-speaking population grows by less than 3 percent. In 2007, the Kaiser Family Foundation reported that 19 million Californians between 19 and 64 years of age are uninsured, and in the 2008-09 budget year, California has a projected structural deficit of roughly $16 billion. (Note—the CA deficit is now at more than $40B!)

The University of California, within this context, also must consider several other factors related to our role in public higher education. Unlike many states, California has a master plan for higher education. We have three public segments. We have a ten-campus University of California system, a 23-campus California State University system that focuses its efforts on baccalaureate and master's degree programs, and 108 community colleges. Under California's master plan UC is designated as the research institution for the State of California. We are delegated exclusive responsibility for doctoral education, meaning Ph.D.s, but also specifically designated as the public sector responsible for health professions education in medicine, veterinary

medicine, and others that lead to a doctoral degree.

Merced is the most recent addition to the University of California system. A good deal of focus has been given to UC Merced and its aspirations for a medical school. Already we operate five schools of medicine and four smaller medical student programs that are operated in tandem with our medical schools. Those programs are located in Berkeley, in Fresno, in Riverside, and at the Charles Drew University of Medicine in Los Angeles. Until 2004, these programs together offered roughly 650 first-year medical student slots. This represents about two thirds of California's allopathic total and about half of all medical students in the state of California, which is also home to two colleges of osteopathic medicine.

Like most medical schools, UC did not grow in terms of medical student education for a period of roughly 40 years. About five years ago we embarked on a strategic planning process for the health professions. This began back when financial times were a considerably better and the magnitude of our state budget deficit was not what it is today, but the primary goal was to create a foundation for a new long range health sciences enrollment plan. We knew that we were falling behind as a state in terms of educational opportunities per capita. We knew that we had workforce shortages looming across the state, particularly in those areas that are experiencing and expected to experience rapid population growth. We were mindful of our master plan responsibilities, hearing from our legislature and elected officials regularly as we do, and we were also aware of the interests of our chancellors and deans and the huge numbers of California students unable to gain admission to a California program.

The effort began with a workforce assessment that was intended to transition to a new system-wide enrollment plan. Our workforce assessment focused on the state of California with both current and projected needs through the year 2020. We focused on seven professions, those that are offered and organized as schools within UC. We didn't attempt to do more than that. That was a daunting enough task as it was. The professions studied included medicine and nursing, public health, pharmacy, dentistry, optometry, and veterinary medicine—the seven professions for which UC collectively operates 15 schools.

So, what did we learn? We learned that California has both existing and looming shortages, particularly in areas that are growing rapidly. We learned and documented the fact that California is now near the bottom of national averages in terms of educational opportunities per capita, in large part because of the delegation of responsibility to UC and the absence of growth within our system for a period of nearly 40 years. From this work, we found a compelling rationale for growth in five professions, with no indication of a need to begin to produce more graduates in dentistry or optometry—but a similar need to improve diversity and geographic distribution of these practitioners.

We worked with our chancellors and with our health sciences deans to rationalize an approach to growth in light of cost, recognizing that growth within our existing schools would be more rapidly accomplished than creation of a new school, and that growth within existing infrastructure could be less expensively accommodated than building new buildings and entirely new schools.

As part of this strategic planning effort, our advisory council involved three regents and our University Provost, and a group that included senior faculty and deans from throughout the system. Recommendations, issued in January 2007, called for a one-third increase in medical student enrollment, among others. Across a 15-year period, the council also agreed that we should begin with a new and different approach to growth. Within the group that participated in this council and this planning effort, there was consensus about the need to do things differently, and the need to be mindful of our societal responsibilities as a public institution.

As we went forward in an effort to make a case for public investment in medical education and other health professions, we wanted to be in a position to demonstrate our awareness and commitment to meeting state needs. For medicine, we recommended that we begin our enrollment growth within our existing schools, but through the creation of dedicated programs with an area of focus on one or more medically underserved medical communities within the state. Areas of focus were to be determined based upon the mission of the school, the priorities of the faculty, and that each should be campus-led in terms of programmatic focus, curriculum, and requirements for admission. The ground rules for participation in this first phase needed

to be through new programs with a focus on the underserved with a dedicated curriculum and process intended for that purpose.

These are our UC PRIME programs (programs in medical education), which have been presented and discussed in some detail at national meetings. The first in the series was launched in 2004 at our Irvine campus with just eight students. We are mindful of the magnitude of impact of these small classes, with the goal for most of these programs being an approximately 10 percent increase in medical school class size for each campus. Irvine will graduate its first class this May and will move to a steady state enrollment (12 students per year) across a five-year degree program of 60 students. The focus of the program is on the Spanish-speaking Latino community. Students are admitted to the School of Medicine first and then go through a supplemental process to assess their level of language proficiency, demonstrated interest, and prior commitment to the community. Most of the training for these students occurs in monolingual Spanish-speaking sites, and the reports, because we've monitored this program particularly closely, show tremendous enthusiasm from the students and the ability of the campus to attract students who were also offered admission by highly competitive schools elsewhere, but elected to attend Irvine because of the specific focus of this program.

In 2007 a number of new PRIME programs were launched. One, at our Davis campus, has a focus on rural medicine and tele-medicine. Davis's mission encompasses the rural northern part of the state with plans for clinical training in the rural primary care network to the north. San Francisco's program focuses on the urban underserved, and the program in San Diego focuses on health disparities and health equity. All of them have a dedicated curriculum that is intended to sustain interest, with careful attention during the admissions process to select the students who come with those values from those communities and then to support them as they move through the program. This year, UCLA, our fifth campus in the series, launched its PRIME program with a focus on diverse disadvantaged populations.

These programs, collectively, will offer about 70 new first-year slots, a little more than a 10 percent increase. They are presently structured as a five-year M.D. with Master's, with the Master's degree based upon student interest and based upon degree offerings on

campus. We are still very early in the process with four of our five campuses, three having just second-year students and UCLA admitting its first class this Fall.

Our plan was to first move through this phase of growth, and then a subsequent phase that would accommodate students within existing schools where there was interest and where there was infrastructure capacity. Our advisory council recognized, however, that even with this combined future growth, the increase in graduates and current capacity of our schools would still fall short of state needs by the year 2020 and beyond. The advisory council recommended that the University begin planning for at least one — contrary to current myth the council did not recommend two — comprehensive new program that would produce new medical school graduates by the year 2020.

We have had a medical student program at our Riverside campus in conjunction with UCLA for more than 30 years. That campus has been actively planning and brought forward to the Regents a request for approval of a school of medicine in July 2008. The Regents granted that approval, contingent upon a viable funding plan, which will make UC-Riverside our sixth school of medicine within the UC system.

A final comment about Merced, and then the budget. Merced is the tenth campus in the UC system. It is located in the San Joaquin Valley, which is home to much of the state's agricultural land. The campus is just beginning to grow. It is profound to watch an entering class of 800 college freshmen double to 2,000, but recognize that in fall 2008, total enrollment is still a smaller campus than at Berkeley High School.

The Merced campus is growing in terms of building, in terms of faculty, and in terms of other things that make up a university. The Merced community and the Central Valley community, together with the Fresno program, have long had aspirations to develop a medical school to meet the needs of the valley. The Merced Chancellor has identified the development of a school of medicine as among his highest priorities, but many are encouraging the campus to plan a more reasonable pace as the overall campus begins to develop. The campus feels the pressure from the community, driven by hopes of economic development, which is not a primary driver in

the case of our PRIME programs and is not the primary factor in terms of Riverside. For Merced, this is among the primary concerns of elected politicians, both in Congress and in our California delegation, who are pushing for the medical school. So we are constantly and perpetually faced with questions about the timing for a new medical school in the Valley.

Within that mix is the state's growing budget deficit. It has been an annual challenge and a responsibility of our new president, past president, and a few Regents to argue for the per student enrollment money that would come with our current growth in PRIME. This was threatened last year. In fact, UC did not receive any state funds for last year's class, but with the agreement of the President and our Chancellors, a redistribution of existing resources to attempt to provide the per student enrollment dollars for the enrollment growth that occurred. This involved only 36 students, but it was a symbolic victory and an important discussion. We had campuses without medical schools agreeing to support the principle of not "launching and then starving" a new initiative that has been as long in the waiting as this has been.

So PRIME is now launched at all five schools. We have approved a new school at UC Riverside, and all these plans will be contingent upon adequate resource support, an improved budget outlook, fundraising, and perhaps a little more creativity.

DISCUSSION HIGHLIGHTS

LESSONS LEARNED FROM PREVIOUS EXPANSION EFFORTS

When we compared Title VII residencies with non-Title VII residencies, we found those who went to Title VII programs felt more prepared in a variety of domains. How can we make this argument for reinstatement and reinvigoration of Title VII?

What's in Title VII today are vestiges of programs originally authorized 20 to 25 years ago, and it's an odd set of programs. The primary care money in family medicine gets the lion's share, but it is a very small pot that gets dumped into a much larger pot, and it's very difficult to measure outcomes. With the National Health Service Corps you could track an individual, so the outcome is easier to measure.

In the 70s, a community of belief played into both politics and private and government discussions that led to both public and private funding. It was clearly a period of more expansive economics, while we are obviously in a very problematic period for talking about new or expanded government programs.

Are you suggesting we take research universities off the hook and say they're not suited for the social mission? Presidents and provosts continue to talk about public good, but what have we really done to demonstrate and build that in?

An analysis of NIH research funding shows that 20 schools get 80 percent of research funds, which means 120 schools are getting 20 percent. In Europe, certain dedicated institutes with established track records do the research and you don't have 140 schools of which 20 are actually doing it and the others are just trying to do it. What those institutions are doing is producing physicians for our country.

When we look at a number of factors, community-based schools rate quite nicely. There's variation between them, but as a whole they have done significantly better than everybody else in terms of social mission.

Often what happens in research-based institutions is that people are more and more removed from medical education, and the people who are engaged in medical education are the people within that culture who are perceived to have failed in research.

Community-based schools are more likely to have a social mission within the purposes of why they were founded. Sometimes within our states and within our universities that social mission is less valued than bringing in research funds and adding to the prestige.

If we fully capitated every medical student, that would add about $1 billion to the $15 billion already spent on GME. But, in return, that would create a lifelong obligation for a real but modest commitment to indigent care, regardless of specialty.

Should we say that no medical student should be admitted who is not bilingual with a second language reflecting a population in need?

If you had a community service commitment (in return for tuition), it could expand well beyond the National Health Service Corps model. You could do your military service. You could do an NIH clinical fellowship. You could take on prison health.

In terms of prestige, it might also be tied to things like quality and service, with the possibility of funding or grants for institutions that try to meet these needs. Institutions could engage in research, like health services research or comparative effectiveness research that does not have the cache — or the funding — of NIH research. But, in re-ordering our house, these are things we ought to think about.

Expansion in the 70s was about putting more physicians into practice and the issue of underserved areas leapt to the front of public discourse. In the 90s, the rise in primary care was tied to the notion of reform, which didn't happen, and managed care, which did happen for three or four years, and then collapsed.

In the 60s and 70s, a lot of practice opportunities were in community health centers. Many academic centers adopted networks of

these centers to meet the demands of society to do something for the community. These centers had interdisciplinary teams, with nurse practitioners and community health workers working in a geographically defined area. Specialists came on a regular basis. There were psychiatrists, lawyers, social workers, and police. That was part of what you learned as a resident.

If you look at graduate medical education and the structural requirements of specialty training, few if any residency programs require no research, either by faculty or by trainees. Every surgical residency, for instance, requires at least a year of full-time research, either interdigitated or separate. Is this the right model when the majority of people who do specialty training never set foot in a laboratory or in a research program again?

If we don't do something that intervenes instead of merely producing more of the same folk, the problems of effective and efficient use of available resources for medical care, and safety and efficacy get worse, because those same folk go into those same areas and generate the same tribal practices.

Part of what needs to happen is a greater conversation with the American public about what is health and what is healthcare? Too often doctors are put between what patients want, even though they shouldn't get it or really don't need it, and what they need. We need a PR campaign or a media campaign about what medical education is, what health and healthcare are, and what baseline things the American public should expect.

I don't think we're going to solve our problems in medical education without solving the workforce issue.

Our initial inaugural class will go to medical school with tuition and living expenses paid for all four years. One of our first initiatives was to raise the money for that, and the money came from the community. We'll have some 100 applications per slot, compared with 40 to 50 at the top five medical schools. That doesn't mean anything except that students care about the funding of their education.

We can look at the (University of California's) PRIME as an example of a public policy oriented rational approach to improving the production of physicians for California. The other genius of it was each campus got to choose which area of need to focus on.

As we've gone around the country, we've seen that innovation abounds at both large universities and small community universities.

Some expectations are things that were traditionally part of medical practice, like service, indigent care, caring for your community and all that we've somewhat moved away from with the current economic model, which has more doctors responding to economic reality, not necessarily abandoning their moral obligation. If we have high expectations of graduates in terms of a community mission, then coming out of school with $200,000 in debt is rather inconsistent.

Trying to figure out what models could meet the healthcare needs of the population is very different from the market forces that determine how our organizations and institutions work, and how the current generation of emerging physicians is making career choices. Without a plan for the nation's healthcare system, we're going to be operating in an environment that is driven by market forces.

What is the ability of medical schools to recruit and retain students who will eventually diversify the workforce? We have had difficulty recruiting such students. We've tried to hone in on the American Indian population and found very few stiudents would even meet our minimum standards for admission. Eventually we had six. One who is not going to make it academically, one who is in trouble, and the rest are borderline.

The growth has been in community colleges, yet medical schools have done little to attract students from different socioeconomic groups.

We need a paradigm shift from recruit and retain to attract and support. How are we going to make medical school more attractive to those talented minority students who are more interested in

business and a variety of other professions? It's our current culture of medicine that needs to change to attract these students.

A lot of highly qualified students drop out from pre-med. They can't imagine incurring $200,000 in debt, given their family backgrounds, where they grew up, and where they live. An awful lot of counseling that students get in rural and inner-city America convinces them that, no matter what, they can't become a doctor; they can't go to medical school; they may not even be able to go to a university.

The notion of choice is something we've taken as an entitlement. By importing one quarter of our physicians from abroad who are willing to go wherever slots are available, we've allowed our students the luxury of deciding what kind of specialists they want to be. If we increase our medical school graduates without an increase in GME slots, the degree of choice that medical students have will become less.

A lot of decisions medical schools make about what one considers the curriculum either leads in the direction of service to underserved communities, attention to healthcare systems, and issues of effectiveness, efficacy, and equity, or doesn't.

We should ask basic questions. What are the sciences basic to medicine? What do we think about constituting panels of patients with chronic disease whom students participate in caring for over several years? Should we think about accrediting medical schools on the basis of whether they are doing that, and doing that in community settings? Should students have some engagement with the principles of quality improvement early in school and then use them as they go along?

Very few students have any longitudinal association with a patient. Imagine that on the very first day you are assigned a patient and the patient was born that day. These are not real patients. They are avatars and live in the computer. At the end of six weeks, that patient is five years old and getting immunizations and at the end of first year, entering puberty. By the time you graduate, that patient may be dying of cancer or suffering from Alzheimer's in a nursing

home. There can be a series of such patients, not to replace the real but to give students a longitudinal experience.

The Cambridge Integrated Clerkship experience is a complete departure from the traditional three months on medicine, three months on surgery concept of how to orient students to the realities of patient care, and it is something worth knowing about.

We made a transformation in our curriculum. We tell students from the start that they are going to make a difference with the chronically ill and that they are going to do a project in the community. Not an option. And not all of our faculty will be physicians. We took an underserved, incredibly poor middle school and they prepared to teach medical students about adolescence. The principal wrote that the students said they had never before thought about being a doctor or nurse. Now we have a list of middle schools throughout the state that want to partner with us.

If you look at the social mission as racial and ethnic equity, a robust primary care workforce, and improved geographic distribution, then medical education debt, or more accurately medical tuition, directly impacts any change.

If we thought seriously about what we're trying to accomplish in medical school, a lot of that could be done in three years. If you did it in three years, you would decrease not only the tuition and the fees but also the cost of living, so it would be a substantial savings.

There are great days as a student when you know that actually being there helped patients have a better experience, or get better care, or have a better understanding of what was going on or, and maybe best, know that someone took the time to spend several hours with them because residents can't do that. Medical students have a strong desire to make a patient's life better, and in the process could learn a lot about what having a chronic disease is really like, not just from the medical standpoint, but from the standpoint of how do I pay for this? How do I deal with loss of work? How does my family deal with this? What's the real impact on people's lives?

I tell my medical students to take the time to get to know their patients because soon they are going to have to learn to run on the treadmill.

We have to be very careful when we think about principles and goals and not solutions. Solutions almost always are local, and you can learn from great experiences, but you can't transport them into your system, unmodified, uncustomized, and unlocalized.

When we talk about faculty development and how we're going to educate students at a time of expansion, we must look at the pressures currently placed on faculty. Often these pressures serve to take them away from the important developmental and educational aspects of teaching. Thus, attending to faculty development and providing incentives for meaningful reform are critically important.


DEBORAH
GERMAN

III.

The State of Medical Education Today

Shortcomings in the Pursuit of the Medical School Education Mission

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Almost 100 years ago (1910), the Carnegie Foundation for the Advancement of Teaching issued what is popularly known as the Flexner report.[1] The report documented serious deficiencies in the ways many of the medical schools in existence at the time were educating their students. The report's findings crystallized the development of a consensus within the profession on the need for major reforms in the country's medical schools and the approaches being used to educate medical students. The report recommended that medical schools become departments of universities, that the schools create full-time faculties composed largely of individuals involved in the conduct of research in the emerging biologic sciences, and that the education program be structured as a four-year course of study with the first two years devoted to the study of the biologic sciences and the last two to the study of clinical medicine. By the mid-1920s, most of the medical schools still in existence had become integral components of universities and offered a four-year curriculum.

It is remarkable that the basic structure of the curriculum that evolved in the early years of the twentieth century has remained largely intact and that it continues to provide the framework for the modern curriculum in most schools. However, the internal organization of the education program has changed considerably over the years. In the 1950s the inpatient clinical clerkship experiences that had occupied the fourth year of the curriculum were moved into year three, shifting the required outpatient clinical experiences that previously occupied year three into year four. And in the 1970s, medical schools began to eliminate the outpatient experiences altogether so that students would have opportunities to participate in elective experiences during year four. Some medical schools also began to reorganize the first two years of the curriculum by eliminating discipline-specific courses in the biologic sciences. The development of an organ system approach for organizing the initial years of the curriculum was the most far-reaching of those efforts. By and large, however, the curriculum in most medical schools in the early 1980s was similar in many respects to the model that

evolved in the 1920s following the release of the Flexner report.[2]

In the early 1980s, the Association of American Medical Colleges (AAMC) embarked on an initiative designed to examine the undergraduate medical education program in existence at the time. To that end, the AAMC established the Panel on the General Professional Education of the Physician and College Preparation for Medicine (GPEP). The panel members were charged to think seriously about the primary purpose of the educational program and how it should be designed and conducted to achieve its objective. At the time the GPEP Panel was established, virtually all medical school graduates had for decades been completing a graduate medical education program (residency program) in one of the specialties of medicine before entering practice. Thus, it was clear when the AAMC embarked on the project that the essential purpose of the medical school experience was not to prepare doctors for clinical practice. Underlying the AAMC's purpose in undertaking the project was the belief that all physicians, regardless of their specialty, should possess a common set of attributes (knowledge, skills, values, and attitudes) and that the medical school experience should be designed and conducted in a way that would impart those attributes to medical students before they entered residency training. The GPEP Report (*Physicians for the Twenty-First Century*) was issued in 1984.[3]

Today, almost 25 years after the GPEP Report was issued, concerns are still expressed about the degree to which medical schools have achieved the goals for the educational program set forth in the Panel's report.[4,5] At the same time, an even more fundamental pair of questions has surfaced: What is the scope of the medical school education mission, and how well have medical schools performed in the pursuit of the mission? These two critically important questions are addressed below.

I. THE EDUCATION MISSION

The education mission of the medical school is first and foremost to contribute to the development of a medical workforce that is composed of physicians capable of providing high-quality care to the patients who seek their help. Because residency programs are responsible for ensuring that physicians entering practice possess the knowledge and the skills required for a specific clinical specialty, the medical education community faces a critically important issue:

What should the medical school experience contribute to producing physicians capable of providing high-quality care?

As noted previously, the GPEP Panel proposed that the medical school's primary contribution to the education of physicians is to ensure that when students graduate from medical school they possess a set of attributes (knowledge, skills, values, and attitudes) that all physicians should possess regardless of their ultimate career choice. However, in order for medical schools to achieve that objective, there must be general agreement on the nature of the attributes that students should acquire. It seems reasonable to suggest that the attributes students should acquire are those they will need to participate effectively in addressing the major challenges facing American medicine—challenges that transcend the practice of individual specialties. Although medical schools have made major changes in the design and conduct of their education programs in recent years, they have not focused sufficient attention on how the programs might achieve the core purpose set forth by the GPEP Panel. This is an important shortcoming in how medical schools have pursued their education mission.

Another critically important element of the medical school's education mission, however, is generally overlooked. Because medical schools control who is admitted to the study of medicine in this country, they are equally responsible for contributing to the production of a physician workforce that is capable of serving the needs of the society at large. And in order to accomplish that, the workforce must be composed in part of physicians whose personal life experiences have prepared them to contribute in special ways to meeting the needs of certain population groups within the society. This aim can only be achieved if medical schools admit students who reflect the socioeconomic, racial, and ethnic diversity of the country's population. Despite a concerted national effort during the past few decades to create more diversity within medical school student bodies, the reality is that little has been accomplished, and there are sound reasons for believing that the situation is likely to grow progressively more serious in the years ahead.[6] This situation must be viewed as another shortcoming in how medical schools have pursued their education mission.

Thus, medical schools face two critically important responsibilities in pursuing their education mission. On the one hand, they must

provide a general professional education that will ensure that their graduates possess the attributes that will ensure that they will meet their responsibilities as members of the medical profession to individual patients and to the society at large as they progress throughout their careers. On the other hand, they must contribute to the production of a physician workforce that can best serve the needs of society by admitting to the study of medicine students who reflect the socioeconomic, racial, and ethnic diversity of the American population.

II. THE GENERAL PROFESSIONAL EDUCATION OF THE PHYSICIAN

An Overview

The GPEP Panel stated clearly that the purpose of professional medical education was to impart to students a set of attributes that all physicians should possess regardless of the specialty of their clinical practice. The Panel did not specify the attributes that students should acquire, leaving this responsibility to the individual medical school. The panel did indicate that medical schools should focus as much attention on students acquiring attitudes, values, and skills as the schools had traditionally focused on the acquisition of knowledge. To support this objective, the Panel recommended that schools introduce into their curriculum more content drawn from the social and behavioral sciences, and the importance of providing a population health perspective. But, by failing to be more specific about the nature of the program they envisioned and the attributes students should acquire while enrolled in the program, the Panel provided little guidance on how schools should evaluate and redesign their education programs to ensure they were consistent with the Panel's concept of a general professional education.

In the early 1990s, the AAMC embarked on a project to determine how medical schools had responded to the GPEP Panel recommendations [Assessing Change in Medical Education—The Road to Implementation (ACME-TRI)].[7] Not surprisingly, the results of their study demonstrated that medical schools were slow to adopt many of the Panel's recommendations. Given these findings, the AAMC decided in the mid-1990s to initiate a project designed to assist medical schools in their efforts to develop the kind of general professional education envisioned by the GPEP Panel [Medical School Objectives Project (MSOP)]. The first

MSOP report, issued in 1998, set forth general learning objectives that schools could use as a guide for redesigning their education programs to ensure that they presented opportunities for students to achieve the stated objectives.[8] In the ensuing years, many medical schools have used the initial MSOP report to initiate a curriculum redesign.

However, as medical schools became engaged in those efforts, the schools' medical leaders learned that they would not be able to accomplish all that they hoped for. They discovered that, while redesign of the pre-clerkship curriculum could be achieved without a great deal of difficulty, redesign of the clinical clerkship experiences offered during the third year of the curriculum was another matter.[9] To a great extent this observation reflected the degree to which individual clinical departments claimed near-absolute control over what they thought students should learn and how they should learn it during their clerkship experiences. As a result, the core clinical clerkships offered by most medical schools remained largely unchanged from those offered decades ago. And it also proved to be difficult to change the fourth year of the educational program because the fourth year provided opportunities for students to elect experiences at a distant location, primarily to decide which institutions to apply to for residency training.

There is no question that many medical schools have made significant changes in the design and conduct of their education programs during the past few decades, and that a number of interesting educational innovations have been developed in the process.[10] But, in reality, schools have not fully embraced the fundamental concept that underlies the general professional education of the physician as set forth by the GPEP Panel. At issue here is the failure to delineate the specific attributes that all physicians should possess in order to meet their responsibilities to individual patients and to the society at large once they enter practice, and to be clear on how their education programs are to be designed and conducted to accomplish that goal. For the most part, the changes that were adopted produced changes in the organization of the curriculum and in the pedagogical strategies employed to enhance student learning.

Specific Shortcomings

As noted previously, the primary purpose of the general professional education provided by medical schools is to impart to medical students

the personal qualities that they will need to participate effectively in helping to address the major challenges facing American medicine once they enter practice—challenges that transcend the practice of individual specialties.[11,12] A number of challenges face American medicine in the early years of the twenty-first century, but two of these challenges are an overriding concern: 1) how to ensure that the millions of underinsured and uninsured Americans can gain access to needed healthcare services; and 2) how to provide personal healthcare of high quality to patients in need. The general professional education of the physician must ensure that all graduating medical students understand fully the importance of these two challenges, and that they possess the attributes that will ensure that they are naturally inclined to contribute to efforts intended to address those challenges effectively.

Medical schools have many shortcomings in meeting their responsibility to provide a general professional education that will achieve these objectives. To address those shortcomings, medical schools must embed at the core of their approach for educating students that the practice of medicine is a social and moral endeavor. Accordingly, medical schools must redesign their undergraduate medical education programs. To accomplish the proposed purpose of the program, medical schools must discontinue focusing the attention of students on a litany of facts drawn from basic science or clinical disciplines. Instead, they must provide opportunities for students to achieve an understanding of the challenges facing American medicine by focusing their attention on those challenges while the students are engaged in learning experiences involving real patients. Medical schools must provide opportunities for students to become immersed in real-life experiences that will impress upon them the realities of the challenges the profession faces, while at the same time exposing them to the difficulties inherent in addressing those challenges effectively. The two most important shortcomings in the education programs now offered by medical schools are discussed below.

III. THE U.S. HEALTHCARE SYSTEM

Healthcare in the United States is a major industry that accounts for almost one sixth of the country's gross domestic product. Despite the fact that the cost of healthcare on a per capita basis exceeds by a considerable degree the per capita cost in every other country, the United States ranks below all other industrialized countries in many

measures of healthcare outcomes. In addition, millions of Americans are unable to obtain needed healthcare services because of the ways that healthcare is organized, financed, and delivered in this country. It seems clear that if the medical profession does not become engaged in addressing the problems inherent in the current healthcare system, it is unlikely that those problems will ever be solved in a rational way. The medical profession is unlikely to play that role unless the majority of physicians understand the responsibility they have to the society as a whole. From a societal perspective, therefore, it is critically important that new physicians have an in-depth understanding of the critical issues that define the country's healthcare system and the ways that individual physicians and the profession affect how the system functions. The lack of adequate exposure to the realities of the country's healthcare system is a major shortcoming in how medical schools pursue their education missions.

Most medical schools provide very little instruction on the diverse ways that healthcare is organized, financed, and delivered in this country.[13,14] Indeed, medical schools grant the M.D. degree to graduating students who have little, if any, understanding of the complexity of the Medicare and Medicaid programs, as well as other private and public sector approaches for paying for healthcare services. Only a few schools provide opportunities for students to learn in an experiential way how the various approaches for paying for healthcare affect the care provided to individual patients. As a result, most students graduate from medical school not knowing, for example, that prescribing a drug they have been taught to employ in treating a patient afflicted with a particular disorder may serve no purpose if the patient's health insurance, if the patient has any, will not cover the cost of the prescription.

It is remarkable that students learn so little about the system they will encounter when they enter practice because the nature of the system will clearly affect their ability to provide optimal care to the patients who seek their help. Medical students also need to gain an appreciation of how doctors' decisions affect healthcare costs and how the high cost of healthcare adversely affects the ability of millions of Americans to obtain the care they need. Students need to understand that, because the decisions that physicians make in their daily practices are largely responsible for how resources are utilized

in providing patient care, physicians are a major determinant of the aggregate cost of healthcare in this country. After all, doctors are the ones who order diagnostic studies, prescribe medicine, determine whether patients will be admitted to hospitals or other institutional settings, and decide how care will be provided in those institutions.

Finally, in most schools students gain only a rudimentary understanding, if any, of the policymaking process. As a result, they gain little insight into how the profession, largely through its professional organizations, has affected the evolution of the country's healthcare system. Students need to gain an understanding of how government policies related to healthcare evolve in this country so that they will be better prepared to participate in the process needed to address the system's shortcomings. The general professional education provided by the nation's medical schools must do a much better job in educating medical students about the reality of the healthcare system as it exists today, and impress on them the responsibility they will have as members of the profession to try to remedy the current situation.

Improving Healthcare Quality

During the past decade, a number of studies have documented that doctors all too often fail to provide care that meets accepted standards and that the systems of care in place in hospitals and other institutions fail too often to provide safely and effectively the care that is prescribed. In recent years, the Institute of Medicine (IOM) has identified the consistent lack of high-quality care as the major cause for concern about the country's healthcare system, and the IOM identified reform of education for the health professions as one of the strategies that must be pursued to improve healthcare quality in this country.[15,16] The lack of adequate exposure to the challenges inherent in providing personal healthcare of high quality is the second major shortcoming in how medical schools pursue their educational mission.

A number of factors contribute to the lack of adequate attention to healthcare quality issues in medical school education programs. However, the most important factor is that the nature of the clinical training provided by medical schools continues to reflect a very traditional view of what medical students need to learn about clinical

medicine before they graduate and enter their residency training.[17] As a general rule, the clerkship experiences do not expose students to a number of aspects of modern medicine that they need to understand in order to be prepared to provide high-quality care to the patients who seek their help.

For example, one of the challenges physicians face in caring for patients is determining the best approach to treatment. An important contribution to the magnitude of this challenge is that the best approach may not be known. This situation is often evident when the physician must provide care for a patient who is afflicted with more than one condition. It is critically important that medical students learn how to determine what could be considered optimal management of a particular condition and how that information should affect the care provided to an individual patient. For this learning to occur, medical schools must play a more prominent role in the curriculum for instruction in evidence-based medicine. Indeed, all of the clinical rotations experienced by medical students must focus prominently on the principles underlying evidence-based medicine and how these principles can be applied in clinical decision making.

Students also need to gain an understanding of the general approaches that can be employed to improve healthcare quality in both the inpatient and ambulatory care arenas. Thus, medical schools must also integrate a quality improvement focus into each of the required clinical experiences. In this regard, it is particularly important that students gain an understanding of the critical patient care roles played by other health professionals and how systems of care affect the quality of the care prescribed. Medical schools must also expose students to the advances made in recent years in the education and training of other health professionals, and how those advances have led to a significant expansion in their scope of practice. To reinforce the students' understanding, medical schools must develop meaningful inter-professional education experiences in the clinical settings where students will encounter patients.

Although each of the issues outlined here applies to the care of all patients, regardless of the nature of their affliction, it is critical that medical students understand clearly that the major challenge American medicine faces in the clinical arena is providing high-

quality care to patients afflicted with a chronic disease.[18] Over 130 million Americans, including 85 percent of all Medicare beneficiaries, are afflicted with one or more chronic diseases. The care provided for these individuals accounts for 75 percent of all healthcare expenditures and is projected to account for 80 percent of expenditures by 2020. With few exceptions, today's medical students, and those who enter medical school in the future, will be involved in the care of a large number of patients with chronic illness regardless of the specialty of their practice. It is essential, therefore, that medical schools redesign the approaches used in providing clinical education to ensure that graduating students have a clear understanding of the incredible challenges involved in caring for these patients.

To accomplish this goal, the nature of the clinical education provided medical students must shift from a focus on the episodic nature of the care provided when a patient is hospitalized to the ongoing, continuous care required by a patient afflicted with a chronic illness throughout the remainder of his or her life. Students must gain an appreciation of the complex challenge involved in managing a patient with a chronic disease over time, and how the common occurrence of a second or third condition makes the care of the patient even more challenging. Students also need to learn that in order to provide high-quality care to a patient afflicted with a chronic disease they will need to gain an understanding of the patient's illness—that is, how the disease affects the patient's sense of personal well-being—as well as how it affects the patient's family. Medical schools must ensure that these opportunities are embedded in the students' clinical experiences.

These critical lessons cannot be learned during rotations on traditional, inpatient-based clerkship experiences. It is now well recognized that students rotating through inpatient-based clerkships rarely have an opportunity to be involved in the care of patients before the patients are admitted to the hospital, or to personally experience what happens to the patients they cared for in the hospital after the patients are discharged. Also, due to the pressure to expedite the management of patients while they are hospitalized, these issues are generally not raised in meaningful ways during attending rounds. Rounds are increasingly focused on making management decisions in a timely fashion rather than student-oriented teaching.

Required clerkship experiences need to be redesigned to provide opportunities for students to gain a better understanding of the challenges involved in caring for patients with chronic illness over time, not just when the patient is hospitalized. To accomplish this aim, medical schools must make important changes in the required clerkship experiences. In each of the required disciplines, more of the experience should be based in ambulatory care settings. In addition, in several of the disciplines the focus of the experience should be changed to provide more emphasis on chronic disorders. For example, there is no good reason why today's medical students should continue to spend a major block of time in a labor and delivery setting while rotating on an obstetrics and gynecology clerkship. Given the need to impart to students the importance of providing high-quality care, it would be far better if the clerkship focused on women's health issues in general, with specific rotations in obstetrics as only a part of the clerkship experience. Similarly, the majority of the pediatric clerkship should be devoted to adolescent medicine, rather than continuing to be focused on well-baby and routine childhood diseases. Indeed, all of the clerkship experiences should be reviewed carefully to determine how they can be restructured to provide a focus on the management of chronic illness.

IV. PRODUCING DIVERSITY WITHIN THE PHYSICIAN WORKFORCE

An Overview

The physician workforce should reflect the socioeconomic, ethnic, and racial diversity of the country's population. Because the diversity of the workforce is determined to a considerable degree by the diversity of the students admitted to U.S. medical schools each year, medical schools have a special responsibility to ensure that the policies and procedures they employ in selecting students for the study of medicine are aligned with that social good. Before examining how medical schools have fared in their efforts to promote diversity within the physician workforce, it is appropriate to reflect on whether the socioeconomic, racial, and ethnic composition of the physician workforce should be an overriding concern for medical schools as they pursue their medical education mission.

There is no question that significant health disparities exist in this

country between upper-income and lower-income population groups, and that minority populations are affected disproportionately. Some people believe that producing more minority physicians would improve access to healthcare for some underserved minority populations.[19–21] While this may be true, it is important to recognize that there is no way to control for the impact that economic realities may have on the decisions that physicians make about where they locate their practices, regardless of their own personal characteristics and backgrounds. Nevertheless, there are data showing that minority physicians are more likely to establish practices in communities composed of minorities and that minority patients are more satisfied with their care if the doctor caring for them shares their background. Perhaps equally important is the belief that a physician workforce that includes more physicians from lower socioeconomic strata, regardless of their race or ethnic background, would make the profession as a whole more responsive to the needs of the underserved, thereby shaping the profession's position on a number of critical health policy issues. Despite a limited amount of data supporting the various positions, there is a strong sense within the medical education community and the profession at large that the current trend should not be allowed to continue.

Shortcomings

The simple fact is that the students who are admitted to medical school each year do not reflect the socioeconomic, racial, and ethnic diversity of the country's population.[22,23] This past year almost 70 percent of the students admitted to medical school came from families with incomes in the top 20 percent for the country as a whole, and African Americans, Hispanics, and other minority groups were seriously underrepresented among the students admitted. There is nothing novel about last year's experience. Despite concerted efforts by the country's medical schools during the past two decades to increase minority representation in their student bodies, the number of minority students admitted each year expressed as a percentage of all students admitted has remained relatively constant, while the average family income of students admitted to medical school has been steadily increasing. As a result, the nation's physician workforce has been growing progressively less representative of the country's population—indeed, it is becoming progressively elitist.

Admission Policies and Practices

In virtually all medical schools, students are selected for admission based largely on their performance in a select group of undergraduate courses that the schools have established as prerequisites for admission—largely science and math courses—and on their performance on the Medical College Admission Test (MCAT).[24] Every year a number of schools announce with great pride the grade point average of their entering class, along with the average score of the students on the MCAT. Many observers have been highly critical of this approach for admitting students, arguing that performance in undergraduate science courses and on the MCAT provides no insight into whether a student possesses the personal qualities needed to be a caring physician, or those required to serve the overall goals of medicine.[25]

Those individuals who are wedded to the current admissions policies argue that the standards being applied in selecting students for admission make sense because they indicate that a student is adequately prepared to pass the intense biological science courses that he or she will encounter as a medical student during the first two years of the curriculum. Studies have shown a reasonable correlation between a student's performance in undergraduate science courses and on the MCAT with how well they perform during the first two years of medical school.[26,27] Thus, if one accepts the logic that a student must complete the first two years of the curriculum successfully before beginning to learn clinical medicine, one can make an argument for the admissions policies being employed by schools across the country.

However, the argument set forth above is based on the assumption that the way the first two years of the curriculum was organized in the past—as a series of intense, discipline-specific courses in the biological sciences—not only made sense in preparing doctors for the practice of clinical medicine at that time but also continues to be relevant to the curriculum in effect today. Medical schools across the country have acknowledged by their actions that the organization of the first two years of the traditional curriculum no longer makes sense. This is reflected by the fact that most medical schools have abandoned the traditional approach of requiring students to complete a series of individual, discipline-specific science courses

in favor of a curriculum that integrates relevant scientific content drawn from multiple disciplines into modular units that illustrate how the content relates to clinical medicine. Medical schools have also decreased the length of the pre-clerkship curriculum by several months, and they have greatly increased the amount of clinical content presented during that phase of the curriculum.

Finally, the Composite Committee of the U.S. Medical Licensing Examination (USMLE) recently decided to consider discontinuing the requirement that students take and pass the current Part I examination. This decision provides further evidence that the medical education community no longer views testing for knowledge of content drawn from individual biological sciences that may not be directly relevant to clinical medicine a valid approach for judging whether a student is being properly prepared for a career as a doctor.[28] Adherence to traditional admissions policies is a major shortcoming in how medical schools are fulfilling their medical education mission.

Another important but generally overlooked dimension concerns the ways in which current medical school admission policies affect the composition of the physician workforce. By emphasizing performance in courses devoted to the physical and biological sciences, medical schools selectively admit students with exceptional performance in those courses. But it is naïve to believe that all of the students who do well in those courses and on the MCAT possess the personal qualities that one would like to see in future physicians. Because virtually all of the students admitted to medical school ultimately graduate, current admissions policies result in some new physicians entering the practice of medicine without possessing the natural inclination for the kind of professional behaviors that are of critical importance in today's healthcare environment.[29]

Also, the traditional approach for judging whom to admit to the study of medicine almost certainly affects the nature of the applicant pool by discouraging some students who are probably perfectly capable of becoming good physicians from pursuing their dream. In the past few years, several studies have shown that the undergraduate course requirements, particularly the continued emphasis on performance in organic chemistry, serve as a disincentive for some

students to even apply to medical school. The most recent report demonstrates the impact of chemistry requirements on the attrition among pre-med minority students at Stanford.[30] A similar result was observed among the general student body at a small liberal arts college in Maryland.[31] Given the schools involved, it would be hard to argue convincingly that the students were probably incapable of performing well if admitted to medical school.

Unfortunately, the medical education community has not developed an approach for accurately assessing whether a medical school applicant possesses the attributes that enable a physician to provide the high-quality personal care that patients desire and need when they are afflicted with a serious medical condition. But this situation should not deter schools from at least establishing course requirements that are more likely to prepare students for the study of clinical medicine than are courses in mathematics and the physical sciences. As a general rule, pre-med students are not required to take courses or seminars in psychology, social medicine, ethics, narrative medicine, or communication skills, although content from these disciplines is now included in the curriculum of most schools.[32,33] Thus, it is somewhat irrational that medical schools have not substantively changed their requirements for undergraduates who wish to apply to medical school.

In developing their curricula and setting forth the course requirements and other criteria employed in selecting students for admission, medical schools should note what master clinicians and scholars of clinical decision-making have to say about the attributes physicians need to care for patients.[34–36] And they should pay special attention to stories physicians tell about their personal experiences as patients.[37] Nowhere in the narratives will one find reference to the need for doctors to know more facts drawn from the physical and biological sciences. The shortcomings identified by the physician-patients relate to their doctors' failure to be as caring and empathetic as they would have liked, and to their doctors' inability to communicate clearly. Surely one might gain a better perspective on whether an applicant might make a good doctor if one had access to how the applicant had performed in courses that related much more directly to the personal attributes that physicians should possess to provide quality care.

The Applicant Pool

Given the failure of a range of special programs that have been established during the past few decades to increase minority representation in medical school classes, it is important to focus on the most critical factor determining the composition of medical school student bodies, namely the impact that a student's socioeconomic background has on the likelihood of the student becoming a medical school applicant.[38] This factor affects the applicant pool in two quite different ways.

To begin, it is clear that the likelihood that a student will complete his or her entire undergraduate studies in a four-year college or university, particularly the more prestigious of those institutions, is determined to some degree by the financial situation of the student's family for the simple reason that the cost of attending those institutions has increased significantly in recent years. In the past 25 years, the median family income has increased by 127 percent, while the cost of attending a four-year college or university (tuition and fees) has increased by 375 percent. Because graduation from one of these institutions is an advantage when applying to professional schools, the ultimate impact of the tuition increases has been to create a pipeline into the professions.

Given that the socioeconomic status of a family appears to be an important determinant of where a student may attend college and, thereby, a determinant of the socio economic, racial, and ethnic diversity of an institution's student body, major universities have begun to develop and implement policies that waive tuition or provide generous financial support for students from "low-income" families, including those with annual family incomes up to $120,000. To some extent, these initiatives can be traced to a growing concern within the U.S. Congress that only students from wealthy families can afford to attend the more prestigious colleges and universities in this country. Indeed, provisions in the recent Higher Education Act will require institutions to report to the Education Secretary if their tuition increases exceed a certain threshold.

It is not surprising that the socioeconomic background of students enrolled in the nation's community colleges, which are far less expensive to attend, varies significantly from the composition of

students who enroll in four-year colleges or universities.[39] In a number of states, the majority of college students are now enrolled in community colleges, and that percentage will increase progressively over time. Nevertheless, few medical schools have made any effort to develop relationships with community colleges that might increase the students' attractiveness as candidates for admission to medical school regardless of the institution from which they ultimately obtain their undergraduate degree.[40]

The socioeconomic background of applicants almost certainly affects the nature of the applicant pool in another important way. Students who come from families with a low family income, regardless of where they attended college, may be unwilling for a number of reasons to accept the level of indebtedness that now is required to attend medical school due to the exorbitant costs involved. To date, the medical education community's approach to the problem has been to do a better job of informing potential students of opportunities for borrowing money to cover the costs of their education. However, providing information about how to incur debt will not alleviate the concerns of students from families with lower incomes about attending medical school if they are hesitant to incur the level of indebtedness common among medical students. Students concerned about the level of indebtedness they face also appear to be affected by the length of training required before they would be able to enter practice to begin paying off their debt. To address this issue, the cost of a medical education will have to be reduced.

To decrease the cost of a medical education, medical schools will need to either decrease tuition on an annual basis or shorten the length of the education program. Shortening the length of the education program has the advantage of not only eliminating one year's tuition but also eliminating the costs of living incurred while students are enrolled in the medical school.

V. SUMMARY OVERVIEW

The shortcomings that exist in how medical schools are meeting their education mission are largely due to the failure of the medical education community, and the profession at large, to acknowledge the important role that medical schools must play in creating a physician workforce that is composed of individuals who possess

the attributes needed to address the major challenges facing American medicine and that also reflects the socioeconomic, racial, and ethnic composition of the country's population. The shortcomings relate to the design and conduct of the education program that leads to an M.D. degree and to the policies that medical schools employ in deciding who should be admitted to the study of medicine.

The policies and procedures that medical schools use to make admissions decisions continue to reflect the failure of schools to consider more seriously the attributes that students should possess on entry to these programs. For example, by not considering the importance of course work in the humanities and the social and behavioral sciences as a factor for admitting students, medical schools are ignoring the body of literature that emphasizes the importance of developing the future physicians' understanding of a particular malady and enhancing their ability to relate to patients on a personal level. Instead, admission to medical school is based almost solely on students' performance in undergraduate courses in mathematics and the physical and biological sciences, as if their ability to recall facts extracted from these disciplines provides insight into their future ability to relate to patients. This practice persists despite the fact that the limited research exploring the role of scientific knowledge in caring for patients shows that doctors rarely if ever use scientific facts in making decisions regarding the diagnosis or management of clinical conditions.[41,42]

Unfortunately, this flawed approach for admitting students to the study of medicine also has a negative impact on the nature of the physician workforce. There is no question that current admission policies contribute to producing a workforce that does not represent the diversity of the country's population. In addition, these practices do not allow consideration of the personal qualities needed for physicians to truly care for patients afflicted with a range of medical conditions. It is essential that medical schools take seriously their collective responsibility to contribute to the creation of a physician workforce that will be more likely to serve the interests of the American public.

It is also critically important that the medical education community, and the profession at large, reach a consensus on the purpose of the undergraduate medical education program *per se*, and take steps to

ensure that the program is designed and conducted in a way that serves that purpose. Although in recent years a number of medical schools have adopted important innovations in the approaches they use to enhance student learning, they have not thought seriously enough about the core purpose of the educational program. In undertaking curriculum reform initiatives, the schools have focused primarily on the pedagogical strategies to be employed to enhance student learning, rather than the content and experiences that will allow students to acquire the attributes they will need to meet the challenges facing American medicine.

In order to place this issue in perspective, it is important to understand why the acquisition of certain attributes is so critical. The simple fact is that the attitudes and values that a physician possesses are important determinants of the kind of care that a patient will receive. Obviously, a physician must possess the knowledge and skills required to provide care to a particular patient in a particular clinical situation. But a key determination of the quality of the care provided is how the knowledge and skills a physician possesses are employed. Because a physician's behavior is often determined by the physician's attitudes and values, the medical school education program must impart those attributes so that its graduates will have a natural inclination to apply the knowledge and skills they possess in the best interests of their patients and the society at large.[43,44]

In addition to possessing the knowledge and skills required to manage a specific clinical disorder, doctors need to possess three key attributes to fulfill their responsibilities to their individual patients and to the society at large: they need to be caring, inquisitive, and civic minded. Given the nature of residency training, the general professional education of the physician provided by medical schools is the best time to embed those attributes in all physicians. Thus, medical schools have a responsibility to design and conduct their education programs in ways that will ensure that all physicians possess those attributes before they enter specialty training.

Given the profound changes that have occurred in medicine in recent years, it is critically important that medical schools make substantive changes in the required clinical clerkship experiences that comprise the core clinical curriculum. A fundamental reality that must be embraced by the medical education community is that

doctors learn how to practice medicine during their residency training and that the majority of residents choose to sub-specialize once they have completed core training in one of the clinical disciplines. As a result of this progressive sub-specialization, an increasing number of physicians will ultimately end up with an increasingly limited scope of practice. For example, the hospitalist movement is differentiating how physicians may be involved in the care of patients with a certain disorder depending on whether care is provided in an ambulatory or hospital setting. Similarly, the development of ambulatory surgery centers and specialty hospitals is affecting the scope of practice of physicians trained in a variety of surgical specialties (e.g., orthopedists who only care for a single joint).

As a result of this progressive specialization, physicians acquire very little, if any, of the knowledge and skills they need to practice their specialty while rotating through medical school clerkship experiences. Equally important, once they are in practice they use very little, if any, of the knowledge and skills they acquired while rotating through various medical school clerkships. Thus, medical schools must take more seriously their responsibility to provide clinical education experiences that are designed and conducted in ways that will allow students to gain an understanding of the major challenges facing their chosen profession and ensure that they acquire the key attributes that all physicians should possess regardless of their specific career path. It is important that they develop approaches that will allow their students to gain a much better sense of the real challenges that patients and their families face when confronted by a medical condition, as well as the challenges that practicing physicians face on a daily basis, instead of continuing to emphasize the acquisition of knowledge and skills drawn from individual clinical specialties.

Another fundamental question that the medical education community needs to address is this: Does it really require four years for a medical school to provide the kind of general professional education that will allow it to achieve its education mission? Assuming that a school's education mission should determine the specific educational experiences in which all students are required to participate, it is clear that the traditional four-year course of study is unnecessary. At present, no medical school requires all students to experience the

same specific coursework during the four years of the education program. Indeed, until relatively recently, the entire fourth year of the program was elective in many schools, and it continues to be largely elective in most even today. In addition, some schools allow students to complete the requirements of joint degree programs in only four years, and there is substantial experience with combined undergraduate and graduate medical education tracks that allow students to complete the requirements for the M.D. degree and for certification in a primary care specialty in six as opposed to the usual seven years. It is also noteworthy that, at one very prominent school, for the past 30 years of the school's history, the last two years of the curriculum have consisted almost entirely of elective experiences.[45] These experiences and others make it clear that there is no rationale for requiring all students to attend medical school for four years in order to graduate with an M.D. degree.

Shortening the length of the physician's educational program is a critically important issue because doing so would have a significant impact on the cost and duration of a medical education. An analysis conducted at the Wharton School of the University of Pennsylvania showed clearly that eliminating one year of the medical school curriculum is the optimal way to decrease the total cost of a medical education.[46] Given the impact that the debt burden accumulated by medical students almost certainly has on students from low-income families, decreasing the cost of a medical education must be a critical element of any strategy designed to produce a physician workforce that more closely reflects the diversity of the American public.[47] Given the costs involved, it makes no sense to require students to spend a fourth year taking a variety of electives that are not deemed to be core elements of the program. Shortening the medical school curriculum of all schools from four to three years has also surfaced as an issue for discussion in Canada.[48] Indeed, two Canadian medical schools—both accredited by the Liaison Committee on Medical Education (LCME)—already provide the education program in three years.

It is generally believed that innovative approaches to the education of physicians are easier to implement in developing medical schools or in separate tracks of existing schools. It is important, therefore, that the issues of concern expressed in this paper receive serious consideration by the medical education community during this

period of medical school expansion with the hope that it might encourage new schools to develop new models for the education of their students. To address these issues, the members of the medical education community must be willing to discard longstanding tradition and accept the possibility that the profound changes that have occurred in American medicine during recent decades require a different approach. At the same time, regardless of how favorably inclined individual medical school faculties might be to the imperative for fundamental change, innovative approaches to medical education are likely to be adopted only if the regulatory bodies that affect the country's medical education system permit change to occur. Therein lies a major challenge!

The fact is that medical schools are not entirely free to make the kinds of changes needed if they are to meet their education mission more effectively. It is unfortunate, but true, that medical schools that would like to adopt these changes will be hampered in their efforts by policies and practices of the key professional organizations that are responsible for the design of the MCAT, which has a major role in determining who is admitted to the study of medicine; the policies and practices of the LCME, which establishes the standards that medical schools must follow to be accredited; and the design of the USMLE, which establishes the national standard for determining the knowledge and skills medical students are expected to have acquired prior to graduation.

Members of the medical education community are actively involved in the development of the policies that govern each of these organizations, and a number of these organizations are led by former medical school deans. Unless individuals holding leadership positions in these groups commit to making fundamental changes in their current policies and practices, it will not be possible for medical schools to make wholesale changes in the design and conduct of their education programs. This is an unfortunate situation that needs to be remedied. It is an issue that deserves serious discussion by those holding leadership positions within the medical education community and the profession at large, as well as by key opinion leaders in government and industry who are concerned about the quality of medical education in this country.

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New Models of Medical Education

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Over the past several decades, innovations in medical education have proliferated.[1] Many medical schools have reformed their curricula, experimented with new pedagogies, created new educational technologies, expanded assessment practices, and created academies of medical educators. These innovations have created a great deal of excitement, generally improved the quality of learning, and been powered by the imagination and energy of the faculty. However, few of these innovations are driven by a systematic conceptual framework and rooted in the learning sciences.

I will describe a conceptual model and its implications for undergraduate medical education. This model is based upon educational research and is connected to our work at The Carnegie Foundation for the Advancement of Teaching. Each component of the model will be described in an idealized form and then illustrated with innovative curricula, assessment methods, and pedagogical strategies that have been in use in medical schools around the country. Finally, the scholarship of teaching and learning will be examined as a mechanism for extending and guiding the reform movement.

Conceptual Framework and Components of a New Model

A conceptual model for medical education can be derived from four research traditions: cognitive psychology, workplace learning, inquiry and improvement, and professional formation. From cognitive psychology, we appreciate the importance of helping learners to build strong knowledge structures and representations (schema, scripts, exemplars, and prototypes,[2-7] to participate in deliberate (conscious and focused) practice with feedback,[8] and to practice using multiple forms of reasoning (critical and creative thinking, pattern recognition, and clinical reasoning).[9] Together, these traditions should focus us on helping learners think deeply, reason soundly, and practice deliberately and repetitively with guidance and feedback.

From research on workplace learning, we recognize the importance of authentic participation in clinical tasks and activities, making visible the thinking processes underlying clinical work, clarifying roles and responsibilities of all participants, being cognizant of the

structure of the work flow, and creating inviting and collaborative relationships among those involved.[10-12] This focus alerts us to the importance of sustained, guided, sequenced, and progressively greater participation in patient care.

From research on inquiry and improvement, we see the importance of adaptive expertise and the need to be constantly seeking greater understanding and solving ever more complex problems. This pursuit of excellence develops habits of mind, or metacognition, that involve a life-long commitment to learning, seeking out, and tackling ever more difficult problems with individual patients and healthcare systems. This form of progressive problem-solving continually seeks to innovate and advance the practice and the field.[13-15] Students need the tools of inquiry, scholarship, and innovation as well as the moral commitment and imagination to advance healthcare throughout a lifetime of practice.

Finally, from research on professional formation and development, we appreciate both the formal curriculum associated with professional values and behaviors of the profession and the informal or experienced curriculum of the workplace, which may or may not embody the highest values of the profession.[15-21] Professional identity is formed through explicit instruction, immersion in the culture of practice, guided experience, and mentored reflection, along with observation and interaction with role models.

If we take each of these four research traditions seriously, the ensuing model of medical education would have the following components:

1. The goal of the **admissions** process should be to select *a diverse entering class* with strong social and basic science backgrounds and exemplary personal characteristics. A variety of measures—and not scientific knowledge alone—should be used to select applicants for the study of medicine. This practice is supported by the need for a diverse workforce and the importance of assessing multiple abilities, values, and commitments that are essential to becoming a competent and compassionate physician.
2. The **curriculum** should incorporate *a balance of formal and experiential learning throughout the first three years* of medical school, including a longitudinal clinical experience connected to

a panel of patients and an ongoing team of providers. This design would embody a spiral curriculum, which would explore concepts and revisit them in successively greater depth; and it would be patient-centered and student engaged. Justification for this recommendation comes from research on cognitive learning and the importance of connecting formal knowledge and clinical experience, deliberate practice, workplace learning, and professional formation.

- The formal curriculum should involve *integrated learning of basic, clinical, and social sciences across the first three years* with a focus on development of strong prototypes of classic signs and symptoms of diseases, conceptual frameworks, and multiple practice opportunities. This strategy is supported by cognitive learning and deliberate practice.

- *Electives for inquiry* and the development of companion forms of expertise should instill a commitment to inquiry, innovation, and discovery. Developing habits of the mind and a commitment to continuously learn and advance the field is as important as mastering a collateral area of expertise. This practice should run across all years of the curriculum and is supported by inquiry and improvement.

- There should be three primary *options for the fourth year*: 1) direct entry into residency if all competencies are met; 2) remediation of deficiencies if competencies are not met; and/or 3) pursuit of scholarship and electives. This structure will allow a reduction in the time to practice, reduce student debt, and still allow some students to pursue elective options and scholarship. If the student enters directly into residency or pursues the option of scholarship, the academic credit for the fourth year should be double counted for graduation requirements from medical school and residency training in order to reduce the total amount of time before entry into practice.

3. For this model to succeed, **assessment** should be focused on progressive learning, student performance, and learning outcomes. In addition to competency-based assessment and professional reflections, students should develop a panel of patients and

receive feedback on patient care processes and outcomes. This practice will connect learning with patient care outcomes and is advocated by cognitive psychology and workplace learning, deliberate practice, progressive problem-solving, and identity formation.

4. These recommendations call for **pedagogies** of engagement and formation. Students need to be actively involved in learning, authentically engaged in patient care, and guided in reflecting on their experiences. This recommendation comes from cognitive psychology and workplace learning, deliberate practice, professional development, and inquiry and improvement.
5. Finally, the teachers must be valued and supported to engage in the **scholarship of teaching and learning**. The educational research community advocates the creation of a "teaching commons" where faculty members can meet, exchange ideas about teaching and learning, and participate in inquiry and improvement. These organizational structures, sometimes referred to as academies of medical educators, honor teachers and provide forums within which faculty members can share ideas, explore pedagogical and curricular issues, and advance the field of medical education.

These major themes will be described along with associated examples of innovations now going on in medical education.

Admissions

The selection process in most medical schools fails to produce a diverse workforce because students continue to be selected from predominantly white and upper-income families. Yet, diversity enhances the quality of education for all students and produces more culturally competent physicians who are better prepared to serve increasingly varied patient populations. In addition, physicians underrepresented in medicine are more likely to practice in underserved communities and more likely to speak languages other than English, thus addressing linguistic and cultural barriers that may exist.[22]

To achieve a diverse medical school class and workforce, we need an admissions process that values diversity and selects students on a broader set of measures than just scientific knowledge. This recommendation has raised companion issues about the undergraduate science prerequisites for medical school and the role of science

grades and scores on the Medical College Aptitude Test (MCAT). For example, some argue that the requirement for inorganic chemistry, which often needlessly eliminates potential applicants to medical school, should be dropped; others suggest that the social sciences, statistics, and human genetics should be added; while others insist that prerequisites be framed as competencies and taught in integrated, cross-disciplinary courses focused on human health and disease.

While the science grade point average and MCAT scores do predict performance on examinations in the first two years, they are not highly correlated with performance in clerkships or later licensing examinations.[23] This is not to suggest that knowledge of sciences basic to medicine is not important but, rather, that such knowledge should be balanced with other criteria for selection. While an applicant's race or gender may not be considered in admissions, universities may give special consideration to such factors as the following:

— Service to groups historically under-represented in higher education

— Potential to contribute to the educational program through the candidate's understanding of the barriers facing women, minorities, and students with disabilities

— Demonstrated drive and motivation to persist and succeed in spite of barriers that disproportionately disadvantage the applicant

— Communication skills and cross-cultural abilities to maximize effective collaboration within academic and healthcare communities

To ascertain the personal qualities of applicants that are essential to the practice of medicine, such as compassion, trustworthiness, and dependability, medical school admissions committees interview prospective students. These interviews, which last from 15 to 60 minutes, are time-intensive and noted for their lack of reliability and fairness.[23] Interviewers tend to select applicants who look much like themselves, thus limiting the diversity of the entering class.

Alternative interviewing practices, such as the multiple mini-interview (MMI), more realistically assess noncognitive factors in the selection process and should be more widely adopted.[24-26] Pioneered at McMaster University and now in use at a number of medical schools worldwide, the MMI consists of 12 stations through which

students rotate at 10-minute intervals—eight minutes for the structured interview with an additional two minutes for the interviewer to complete the assessment form and the student to move to the next station. There are three types of stations: discussion, interpersonal skills, and cooperation. Discussion stations consist of a scenario that triggers a discussion with an assessor of a general issue, such as an ethical conflict, which the applicant responds to and defends. With multiple stations, a variety of political, ethical, and educational matters can be addressed. An interpersonal skills scenario describes an emotionally laden situation and asks how the applicant might address and resolve it. In a cooperation station, two applicants must jointly complete a task that requires a high degree of cooperation. In all stations, an independent assessor interacts with and rates the candidate's performance.[27] Because applicants complete the 12 stations in a half-day session, two sessions can be run each day. Names are changed to reduce the likelihood of breaches of confidentiality.[28,29] The MMI has proven success in assessing noncognitive attributes in a reliable and valid manner, and it seems to offer a greater degree of fairness than the traditional interview.[30]

Curriculum

With the anticipated changes in the United States Medical Licensing Examinations (USMLE), medical schools are beginning to imagine what a curriculum might look like if the classic two years of basic science courses plus two years of clinical clerkships were redesigned. Some schools are planning for a three-plus-one curriculum: three years of integrated and balanced formal knowledge and clinical experience plus one final year for student options, including early entry into residency training, pursuing scholarship, or remediating competencies, and exploring career options.

To create an early and powerful clinical immersion experience, students would need to spend significant amounts of time in clinical settings from the beginning. This might involve one or two days a week in the first year, two to three days a week in the second year, and four days a week in the third year. To promote professional development, students would need to be assigned to a single hospital or multispecialty clinic for an extended period of time and to work with a small group of teachers, longitudinally following patients through ambulatory clinics and inpatient services and developing their own panel of patients. Students at that site could form a small

learning cell or multiple cells consisting of first-, second-, and third-year students as well as a preceptor. If this "cell" were connected to residency training, it might also include a resident, a nurse, and/or a pharmacy student. The formal structured curriculum could be explored in the context of real patients from the student's panel of patients. An integrated, patient-centered curriculum could run in parallel with patient care experience across three years and provide deeper exploration of knowledge with each year. With increasing levels of immersion in patient care, greater connections could be made to the basic, clinical, and social sciences.

Running in parallel to this integrated clinical experience and development of scientific knowledge would be elective opportunities for students to learn about an area of focused expertise beyond the general skills of a physician. These areas of concentration or scholarship should equip students to understand and advance the field and lead to career opportunities in such areas as basic and clinical research, public policy, healthcare leadership, medical education, and global and public health. The key feature of this component of the curriculum is to develop habits of mind that instill continuous learning, inquiry, innovation, and discovery. Students would be engaged in coursework and experiential learning and would produce an appropriate legacy project or document. Many students would want to participate in a more extended period of research and skill development and would therefore complete a fourth year. With some collaboration, residency programs could grant credit toward completion of residency training for the research engaged in during the fourth year. Some students might simply want to participate at a minimal level and finish their undergraduate medical education after three years.

This vision is feasible, and examples of innovations that could make this model work already exist. The following sections describe such examples of longitudinal clinical experience; integrated basic, clinical and social science instruction; elective options to advance inquiry; and a flexible fourth year.

Early Immersion and Longitudinal Clinical Experience

Over the past three decades, medical schools have increased clinical exposure during the pre-clerkship curriculum. This practice began with the creation of doctoring courses in which students learned to

interview and communicate with patients, take a history, and do a physical examination. These courses are typically offered weekly and take place in small groups, where skills can be practiced. In many schools, preceptor experiences are also offered in a physician's office so that students can practice the skills they are learning on real patients. In schools with clinical skills centers, this form of instruction may include trained or standardized patients.

The trend is to further increase clinical experience in the first two years. Some schools devote two half-days a week to clinical preceptorships in the first year and four half-days a week in the second year (Mayo). Other schools offer immersion experiences on an inpatient team for two weeks at the beginning and end of the first year of medical school (Loma Linda) and in community preceptor offices for two weeks at a time (University of Florida). In the third year, the University of South Florida, for example, has created a 16-week required ambulatory block and has merged inpatient block rotations into new interdisciplinary clusters.

Another approach to establishing longitudinal relationships in clinical education is taking place at several surgery programs (e.g., Northwestern University and University of Pennsylvania). These universities have incorporated apprenticeship rotations in which a resident and a student are assigned to a surgeon or a small-group practice for one month. The trainees follow the same schedule as the surgeon to whom they are assigned. This program was designed to provide residents and students with more guided and sequenced surgical experience and to offer more opportunities for students and residents to participate in procedures and in the care of surgical patients. Evaluation of the Northwestern University apprenticeship program has revealed that the program achieves these goals and more.[31]

A number of variations of integrated, longitudinal patient-care experience can exist in a single medical center. Some of the many medical schools that already offer such programs include the Rural Physician Associate Program (RPAP) at the University of Minnesota, the Yankton Program at the University of South Dakota,[32] the ROME program at the University of North Dakota,[33] the WRITE Program at the University of Washington,[34] the Cambridge Integrated Clerkship (CIC) at Harvard Medical School, and the PISCES program at the University of California, San Francisco Medical Center. All but the

last two clerkship models occur in rural settings. All of these programs are built on an apprenticeship model, but each is slightly different. For example, the WRITE program requires that students take all of their inpatient clerkships at University of Washington teaching hospitals in the first six months and then participate in a primary care rural practice for the second six months. RPAP is used here as an example of a the rural model, and the Cambridge Integrated Clerkship serves as an example of an urban model.

The Rural Physician Associate Program. Established in 1971, RPAP is an integrated clerkship designed to increase the number of primary care physicians who practice in rural communities in Minnesota. RPAP is a nine-month, community-based, elective program offered to third-year medical students enrolled at the University of Minnesota that begins in October and ends in June. Students receive a scholarship for participating in the program, and spouses and children accompany the student to the site.

Students apply to RPAP in their second year of medical school and spend nine months in one of 100 small towns in Minnesota that participate in the program. Out of the 36 weeks of RPAP, up to 24 weeks can apply to the required clerkship rotations for primary care, emergency medicine, pediatrics, surgery, obstetrics/gynecology, urology, and orthopedic surgery—depending on the site's ability to meet course requirements. Before beginning RPAP, students must complete the medicine and obstetrics/gynecology externships. They can then finish the remainder of their required and elective rotations afterwards.

While the teaching at each site varies, students are generally assigned to a primary preceptor, typically a family physician, and then work closely with other specialists as well. Students must spend the first and last six weeks with their primary preceptor doing continuity care.

Students accompany a physician on hospital rounds, assist in surgery, pursue self-directed learning, and see patients in clinic. Night call is assigned with physician-preceptors approximately every fourth night and every fourth weekend. Students spend an average of 59 hours a week in the hospital and clinic, seeing about 75 patients each week (77 percent outpatients), with a distribution of age, gender, and diagnoses. On average, students first assist on 150

procedures, deliver 26 babies, and report 32 hours of direct teaching contact weekly with their preceptors.[35]

Grades are based on community preceptor evaluations, shelf examinations from the National Board of Medical Examiners for the required clerkships, and a primary care Objective Structured Clinical Examination that is given at the end of RPAP.

Since its founding class in 1971, RPAP has trained over 1000 physicians; 60 percent of whom now practice in rural areas of Minnesota and elsewhere, and 80 percent are in primary care practices.[35] RPAP students perform as well on National Board examinations and on the Primary Care Clerkship objective structured clinical examination (OSCE) as do their peers, and they are highly sought after by regional residency program directors once they complete the program.

Cambridge Integrated Clerkship. One of Harvard Medical School's affiliates, the Cambridge Health Alliance, was the first to create a site-based, year-long clerkship experience. This urban medical center enrolls 12 Harvard medical students in an immersion experience that offers longitudinal connections with a variety of patients across all venues of care under the guidance of dedicated preceptors. By following their patients through the healthcare system, students receive a better understanding of the patients' experience with the system and the natural progression of their diseases. This experience offers students a way to actively integrate knowledge across specialties, adapt their knowledge and skills to new arenas of service, and create a uniquely personalized learning experience.

The integrated clerkship is organized around four principles of continuity: care, supervision, curriculum, and idealism. Students build their own cohort of patients in each specialty discipline and follow their patients across all venues of care. Faculty members rather than residents are the principal educators who support, advise, and mentor the students. The curriculum progresses developmentally across the year and is based upon real cases, student-led tutorials, and simulation exercises.

The key components of the curriculum are patient care experiences in weekly half-day clinics held throughout the year in a variety of specialties (internal medicine, neurology, psychiatry, pediatrics, obstetrics/gynecology, and surgery) with the same set of preceptors,

taking call one evening a week in the emergency department, participating in weekly tutorials, and interacting with an assigned mentor throughout the year who oversees the student's development and reviews the student's self-reflections and case diaries. Students participate in a year-long clinical procedures course, attend weekly master clinician teaching rounds, and develop their own panel of patients that they follow over the course of the year. This caseload includes about 15 patients in internal medicine, 10 from pediatrics, and 5 to 10 from psychiatry, neurology, and other areas.

Students benefit from the continuity of working at one site, with a core group of physicians and fellow students. Unlike the traditional clerkship, in which residents provide the majority of instruction, in the integrated clerkship the faculty members are once again the primary teachers. This structure also creates a strong cohort of students who support and challenge each other. The integrated clerkship incorporates multiple disciplines simultaneously so that students move through a curriculum that is more integrated and developmental.[36] Finally, student performance is assessed developmentally using core competencies derived from the Accreditation Council for Graduate Medical Education (ACGME) adapted to medical student education.

Initial evaluation of the program indicates that students learned as much or more of the standard specialty-specific knowledge; developed strong clinical skills, especially in communication; and felt much safer and more supported than students in the traditional Harvard block clerkships. Students in the integrated clerkship reported more interactions with faculty members and much more positive feelings about the third-year experience. They also exhibited a more holistic understanding of patients' experiences, a deeper understanding of and identification with the role of a physician, and a more comprehensive view of the healthcare system.[37-39]

Third-year longitudinal integrated clerkships could be extended over the first 20 years as well if they are offered at a medical center near the medical school. Ideally, an integrated curriculum of basic, clinical, and social sciences would be linked to these longitudinal clinical experiences.

Integration of Basic, Clinical, and Social Sciences

In the pre-clerkship curricula, medical schools have worked diligently

to integrate disciplines within blocks and organize instruction around organ systems such as the heart or topics such as cancer. These block courses carry such titles as cardiovascular system, endocrine system, and nervous system. Many schools introduce every topic or unit of content with a patient case in order to make the information clinically relevant and as a mechanism for connecting the various disciplinary perspectives being studied. Some schools cover normal and abnormal body functions in a single block, whereas others separate the two into different courses. Those schools that combine normal and abnormal body functions in a single block point to the literature that suggests that a compare-and-contrast learning strategy enhances learning;[2,3] thus, having normal and abnormal together improves learning. Those who separate normal from abnormal functions argue that the two are distinctly different and covering the same organ twice enhances learning through repetition. The literature provides no conclusive evidence for either approach.

Another integrative strategy is to create a theme for the whole curriculum. This theme might be preparation for primary care specialties in rural communities (North Dakota); some aspect of public health (New Mexico); or curricular themes, such as genetics (University of Vermont) or research (Duke, Harvard/MIT, Stanford, Yale, UCSD, Cleveland Clinic). The content and skills a student needs to learn in order to be proficient in these additional areas of study are integrated throughout the curriculum.

In clerkships, several integrative strategies have been used. Some schools cluster disciplines into the same block of time. Psychiatry and neurology are the most common disciplines using this integrative strategy. A second approach is to cluster services provided to particular types of patients in particular settings. Examples of this structure would be an emphasis on mothers and children that would combine obstetrics and pediatrics. Other structures emphasize location and focus of practice, for example ambulatory clerkships that combine portions of internal medicine, family medicine, pediatrics, psychiatry, obstetrics, and gynecology. The structure would focus on normal growth, development, and/or management of chronic diseases. Inpatient clerkships might include internal medicine, surgery, and surgical specialties. Site-based curricula are developing at Harvard hospitals and at UCSF (University of California, San

Francisco) hospitals (e.g., care for underserved patient populations at San Francisco General Hospital).

Additional strategies include the use of intersessions: blocks of time, typically a week, when students are brought back to campus for intensive courses on ethics, therapeutics, healthcare systems, quality improvement, and advances in medical sciences. No single clerkship can provide this level of instruction, and clustering it into blocks makes it possible for students to focus on core curriculum.

Integration across undergraduate medical education (UME) and graduate medical education (GME). A few schools are beginning to think about integration across UME and GME. In some instances, the intent is to reduce total time to practice by allowing some students to enter residency training after three years of medical school (Marshall University and University of Tennessee).[40,41] Other schools are creating pathways or elective paths that add value to the core curriculum by creating academic programs that can be entered at the UME and GME levels and lead to certificates and advanced degrees. At UCSF, such a program also bridges across health professions and encourages students from all professional schools to enroll in Pathways to Discovery courses and programs.

Integration through interprofessional team learning. A final form of integration provides students with an opportunity to work as part of an interprofessional team as a means to understand the varying roles and responsibilities of other health professionals. Strong collaboration in healthcare teams reduces staff absenteeism, creates a more satisfying work environment, and improves patient care.[42] In quality improvement initiatives, interprofessional education is often used as a means of advancing practice improvement.[43] Students generally appreciate interprofessional educational opportunities, which provide them with the knowledge and skills necessary for collaborative work. However, such experiences are less likely to provide a positive influence on their attitudes and perceptions toward others members of the healthcare team. The effects of interprofessional education on practice and healthcare outcomes are mixed. The results of a few studies indicate that such programs improved the knowledge and attitudes of participants, increased patient satisfaction, improved work culture, and reduced errors. However, several other studies found no change on these variables

as a result of these interprofessional educational interventions.[43-45]

At both UCSF and the University of Arizona, interprofessional team training begins in the first year with large class sessions with approximately 300 students who are assigned to mixed professional groups to discuss cases and issues of teamwork and professional collaboration. A number of schools engage students from multiple professional schools in small-group learning, typically around quality improvement. The University of Utah developed a pilot program to train interprofessional teams (medical, nursing, pharmacy, and health) using a standardized patient exercise. Each student performed a 15-minute intervention while the other team members watched the video. After each member interviewed the patient, the team members created a comprehensive plan, which was presented to the faculty. This presentation was followed by a group discussion. Students rated the experience positively.

In the majority of medical schools that employ healthcare team programs, these programs occur during clinical rotations.[46] At the University of Pennsylvania, where lectures and panels are presented in the first two years and during the Introduction to Clinical Medicine course, the internal medicine clerkship, and the family medicine clerkship, students make home visits with an interprofessional team that includes physicians, nurses, social workers, and health technicians. During the primary care clerkship, students are expected to spend time with the office staff to enhance their understanding of their roles in the office practice and procedures.[46]

Learning Inquiry and Improvement

While learning the habits of mind associated with inquiry and improvement should be included in every aspect of medical education, these lessons can also be learned through system improvement and scholarship.

Whereas certain aspects of the practice of medicine can be guided by technical rationality, formal knowledge, and evidence-based medicine, a large part of medical practice involves dealing with unique patients with uncertain problems and conflicting values and goals—what Schon calls the indeterminate zones of practice.[14] Competent physicians use knowing-in-action strategies to perform common or routine actions by using automated, tacit knowledge.

They may also slow up and use a more effortful problem-solving approach, reflection-in-action, which requires assessment, reformulation of the problem, and creative thought and/or experimentation.[47]

Added to this form of adaptive expertise is the concept of expertise as a commitment to continuous improvement of care for individual patients and patient populations. This concept involves going beyond routine expertise and the satisfaction of having mastered certain tasks to develop strategies for continuous learning and engaging in inquiry, innovation, and improvement. When students and practitioners encounter complex problems, they can either simplify the problem and dispense with it as quickly as possible or delve more deeply into it and advance their understanding and skills. Working on perplexing and unresolved problems develops a knowledge-building orientation of inquiry, innovation, and improvement. As some activities become more routine and automated, practitioners can engage in progressive problem-solving by reinvesting cognitive effort into the more difficult and challenging aspects of problems—thus continuously learning and advancing the work.[13]

Progressive problem-solving, reflective practice, and the development of adaptive expertise are incorporated into UME and ACGME competencies of practice-based learning, improvement, and systems-based practice. The integrative knowledge, skills, and commitments of these competencies are aligned with inquiry, discovery, and improvement.

Quality improvement. The healthcare system itself offers ways to learn systems-based practice and improvement. Often dysfunctional organizational structures exist that work against quality care (e.g., inability to get a consult in a timely manner, to schedule a patient for radiology, to get a rapid turnaround on a lab test, or to get a social worker to arrange for hospital discharge) but continue to operate because students and residents make such a structure work. In short, the patient does not receive quality care and the students and residents spend an inordinate amount of time performing tasks generated by a dysfunctional system. A systems perspective and moral imagination can help empower students, and later residents and practicing physicians, to advocate for change in systems that affect patient care.[15]

System improvement endeavors are learned through reading and discussing examples from the literature of quality improvement and by actively engaging in selected aspects of quality improvement and error reduction projects. Some schools have begun to establish systems improvement projects for students. Students are typically assigned to analyze a system problem or adverse event, set up a study of the current situation, design a new approach, and propose an approach to implement and measure it. In the newer longitudinal clerkship models, students participate in a team-based quality improvement process, which is more feasible because students are in the same setting for an extended period of time. In such a manner, students see quality improvement and error reduction efforts in action and can contribute to them in meaningful ways. This practice communicates the value of doing the right thing for the patient every time. To ensure some initial success at system improvement along with habits of self-directed learning, preceptors need to coach students on these activities over the course of the year and discuss the projects in a continuity tutorial.

The University of Missouri-Columbia is building a continuum of learning about healthcare improvement from the White Coat Ceremony in first year through residency education.[48,49] The school is now integrating interprofessional team learning into existing courses using three key strategies: integration of theory and practice, assessment of learning, and creation of interprofessional experiences. For example, in the second year students participate in a four-week problem-based curriculum that includes medical, nursing, respiratory therapy, and health management students. In small groups, the students examine adverse events and plan a system to eliminate errors.[50] Students document their improvement work in their portfolios, and significant achievements become part of the Medical School Performance Evaluation, formerly known as the "Dean's Letter."

At the University of Connecticut, every student does a quality improvement project as part of the primary care clerkship. The health system quality improvement coordinator oversees the work of the medical student, which is impressive given the class size of 200 students.[51]

Inquiry and scholarship. Cultivating such habits of mind as curiosity, inquiry, reflection, situational awareness, and flexibility is essential

to the pursuit of better outcomes for patients and populations. These habits can be developed through formal instruction; through personalized and normed feedback on patient care outcomes and processes; through guidance and coaching from experts and near peers that progressively push students to the limits of their competence and advance their knowledge and skills; through observing role models who embody and demonstrate commitment to excellence; through projects that improve micro-systems and reengineer work; and through exposing learners to the messy, complicated, and unresolved issues of the field. Inquiry and improvement should be built into the fabric of the learning environment and become part of the culture, "the way we do things here."

Inquiry and improvement are also aligned with our classic methods of scholarship. Scholarship is about being curious, asking questions, challenging assumptions, delving deeper, experimenting, evaluating, discovering, and seeking generalizations. In short, the knowledge, skills, and commitments of scholarship involve continuous learning, reflection, progressive problem-solving, and field building.

Students should be actively engaged in scholarship while in medical school as a means of developing these habits of mind. Many forms of scholarship exist in the basic, clinical, and social sciences—one size does not fit all. Many schools are creating elective tracks that offer entry into the scholarship of the field and a clear and transparent pathway to successful performance in a field of research. For example, students can pursue elective programs in molecular medicine, clinical and translational research, global health sciences, public health, or medical education, as well as social and behavioral sciences in medicine. These elective options allow students and residents to pursue collateral areas of interest that offer additional career opportunities for them upon graduation and enhance their ability to use the tools of scholarship. These programs have been referred to as areas of concentration, areas of scholarship, areas of distinction, and pathways to discovery. Such programs seek to produce leaders in research, academics, public policy, healthcare system leadership, and service to the underserved.

The Pathways to Discovery program at UCSF is an example of such a program. Like an academic minor at the undergraduate level, it provides institutional structure for sustained interdisciplinary projects

in five thematic areas throughout a student's curriculum (molecular medicine, clinical and translational research, global health sciences, health professions education, and health and society). Students identify a project and work with faculty advisors to complete a thorough program of preparation and to focus their inquiry. Prior to graduation, students produce and present a tangible legacy, which may be in the form of traditional scholarship or a completed project.

Stanford offers Scholarly Concentrations, a required program that promotes in-depth learning and scholarship. This program provides students with faculty-mentored scholarly experiences in areas of individual interest combined with structured coursework to support this scholarship. This component of the M.D. curriculum develops critical thinking, skills in evaluation of new data, and hands-on experience with the methods by which new scholarly information is generated.

Research-intensive medical schools, such as Duke University and the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, have distinctive required programs for immersing students in the research culture and providing students with guided experiences in research methods with the aim of producing future academic physicians who are committed to conducting medical research. At Duke, a full year of research is incorporated into the four-year curriculum by compressing the basic sciences into one year. At the Cleveland Clinic, research is an integral part of the whole five-year curriculum.

Other universities dedicate time for scholarly projects that are completed in the fourth year. This is the case at the University of Washington, University of California, San Diego, and Yale University.

Medical students can learn inquiry, discovery, and improvement through learning the practice of medicine as well as through scholarly tracks in the curriculum.

Fourth-Year Options

This new model of medical education incorporates three primary options for the fourth year: direct entry into residency if all competencies are met, remediation of deficiencies if competencies are not met, further career exploration if desired, and pursuit of scholarship

and elective options. While very few students would likely pursue an accelerated residency program option, this opportunity is already available at several medical schools. This program eliminates one year of training by combining the requirements of the fourth year of medical school with those of the first year of residency. The University of Tennessee and Marshall University both provide this option to students entering family medicine. These programs have existed for over a decade, and the outcome data suggest that students who enter these programs have excelled academically and performed as well or better than non-accelerated residents on standardized tests.[40,41] An alternative approach has been taken by the University of Minnesota, which allows students to complete the M.D. degree in three and a half years if they demonstrate competence.

Not all students are likely to master all competencies in three years and to proceed directly into residency training; some students instead prefer to explore areas of personal and professional interest, examine career options by taking elective rotations, conduct research, and prepare themselves to become interns. Classically, students have needed to take two or three intensive sub-internship experiences managing patients on inpatient services in their fourth year to prepare for internship. These specialty-specific, sub-internship rotations offer students major responsibility for patient care under the supervision of the faculty.

The other purpose of the fourth year is to allow students to explore career options and interview for residency positions. Flexible time for this activity is important, as is the opportunity to take additional clerkships in specialties that are not in the core clerkship experience. The major challenge with this individually developed program of study is providing appropriate career advising services so that students make good decisions.

For the elective portion of the fourth-year curriculum, medical schools have taken a wide variety of approaches, including the scholarly concentrations programs at Stanford and UCSF described above. Another alternative is offered at UCLA, which structures electives in the fourth year around systematic preparation for specialty choice. College activities include an introductory course focused on advanced clinical skills and decision making, a monthly series of evening seminars, a longitudinal academic activity that can be either

teaching or scholarship, and regular advisory meetings. The colleges include Acute Care, Applied Anatomy, Medical Science, Primary Care, M.B.A./M.P.H., and Drew Urban Underserved Program.

The fourth year can be used to advance student levels of responsibilities for patient care in sub-internships, remediate deficiencies in competencies, pursue scholarly concentrations, and enter directly into residency training.

Assessment

For this new curriculum model to succeed, assessment must be expanded and transformed. Assessment of student performance should be focused on guiding and motivating progressive learning of competencies (formative assessment as feedback) and certifying acceptable levels of performance (summative evaluation of learning outcomes). Assessment of formal knowledge, clinical performance, and professional formation should be examined in the context of competencies (as defined by ACGME or the school), thus ensuring that all areas of performance are evaluated.[52-55]

In addition to competency-based assessment and professional reflections, students should be connected to a panel of patients and receive feedback on patient processes and outcomes.

Cognitive knowledge and clinical reasoning have long been the focus of course work, clerkship, and certifying examinations. These objectives are most frequently achieved through the use of multiple-choice examinations, which can sample broad areas of content knowledge rapidly and efficiently. Most medical schools purchase examinations from the National Board of Medical Examiners (NBME) for end of course and/or clerkship testing because these tests are of higher quality than can be produced locally and the NBME provides national benchmarks of performance for feedback to students and programs. A number of schools use progress testing, which consists of a single exam that is given to every student in the school twice a year. This exam documents continuous growth in knowledge across the curriculum.[56] Concept mapping, as described by West et al., is another approach.[57]

In clinical settings, the primary assessment method is faculty and/or resident global assessment of student clinical performance. The

quality of these assessments varies depending upon the extent to which the faculty member or resident has worked with and observed the student (as opposed to just hearing them verbally present a case). Longitudinal integrated clerkships and longitudinal clinical mentors help overcome some of these problems because they allow more time to get to know students, observe them, and give them feedback on their performance.

Assessment of competencies other than medical knowledge requires different methods of evaluation. Clinical reasoning, communication skills, procedural skills, and professionalism can be assessed in practice settings and by using simulations and objective structured clinical exams. These approaches offer reliable mechanisms for ensuring that all students meet minimal standards of performance, and if students fail they receive the needed remediation and retesting. Simulations are used to assess individuals and teams. Both medical schools and hospitals have established simulation and clinical skills centers to train students, residents, fellows, interdisciplinary teams, faculty members, and practicing physicians.[58] Additional forms of assessment in these areas include review of history and physical exam findings, review of patient write-ups, interviews with patients after the student has seen them, and occasionally ratings provided by patients, peers, and staff.[59]

Professional formation is a developmental and multifaceted construct that involves the integration of clinical competence, communication skills, and ethical and legal understanding along with the aspirational qualities of excellence, humanism, accountability, and altruism.[60] Using appreciative inquiry, Indiana University has focused on the informal learning environments as well as the formal curriculum as a means of improving professionalism. They established a formal curriculum that requires students to master nine competencies and an informal curriculum that supports the moral, professional, and humane values espoused in the formal curriculum.[61]

Assessment of professionalism is challenging because it involves integrative capacities, inferred values, and individual learning trajectories.[62] Attitudes and observable behaviors, such as reliability, honesty, and organization, can be captured using written comments or global assessments by residents and faculty members.[60,63] When egregious violations of acceptable standards occur, formal reporting

systems document and deal with such instances.[64,65] At UCSF, two items have been added to the clinical teacher rating form: "treats me with respect" and "treats others with respect." If a faculty member or resident receives low ratings on these two items, the Associate Dean for Student Affairs is notified. If multiple low ratings appear, then the Associate Dean will work with that individual and/or his/her department chair to rectify the poor behavior. Professionalism also needs to include systems thinking and the moral commitment to improve healthcare systems.[15]

The University of Texas Medical Branch in Galveston, under the leadership of the president and dean of the school of medicine, has worked relentlessly to develop a corporate culture of professionalism. The program involves faculty members, staff members, healthcare professionals, residents, and students. Every policy and program is viewed through the lens of professionalism. The program is rooted in the professionalism charter and requires every member of the university community to make the following pledge: "On my honor, as a member of this university community, I pledge to act with integrity, compassion and respect in all my academic and professional endeavors."[66]

Because most medical students graduate without ever having been observed performing a complete history and physical examination, some schools are insisting that faculty members make selective observations. In internal medicine, many schools are using the mini-CEX (mini–clinical evaluation exercise) for focused observations in order to provide students with feedback. The total process takes approximately 20 to 30 minutes to complete, and the reliability of the exam is equivalent to that of an objective structured clinical exam with the same number of observations.[67] A brief objective structured clinical observation (BOSCO) achieves the same purpose: to observe a student for two to five minutes in order to provide specific feedback.[68] The RIME model (recorder, interpreter, manager, educator) is another conceptual framework for both instruction and assessment.[69]

The final two competencies, systems-based practice and practice-based learning and improvement, are more difficult to evaluate. Some schools involve students in quality improvement projects, others assign students to care for and learn from a panel of patients

during longitudinal clerkship experiences, and most offer coursework on patient safety, error reduction, and system improvement strategies.

Schools are increasingly moving toward comprehensive assessment and individualized learning plans.[53,61,70,71] The University of Rochester has a comprehensive, competency-based assessment of student performance that tracks student achievement across the four years and has major integrative assessment periods at the end of each year.[70] This program uses multiple forms of assessment and assembles the assessments into a portfolio in which projects and self reflections can be displayed.[72] When portfolios are used for personal and professional development in conjunction with regular meetings with a mentor, students find that this reflective process contributes to their professional development.[73] The Cleveland Clinic is one of many institutions using electronic portfolios longitudinally throughout medical school.[74]

A developmentally paced assessment system that measures progressive achievement of learning objectives and competencies is essential to a new model of medical education. Formative feedback can guide and motivate learning, and outcomes evaluation can certify competence.

Pedagogies

The new model is predicated on the use of stronger and more systematically integrated pedagogies that connect patient care experiences with classroom-based formal learning in a seamless manner across three or four years. This model will incorporate the following components:

— Patient-driven learning with preceptors and role models who engage students in authentic and progressively sequenced patient care experiences; make visible their clinical reasoning; and support, challenge, and coach students in their clinical thinking, clinical skills, and professional behaviors

— Tutorials that actively involve students, often directed by students, and frequently driven by students' own patients; these tutorials would involve learning from peers and near peers in site-based and cohort-based tutorials

— Simulations and standardized patients that develop and later certify competence

— Technological resources that promote individual and collaborative learning, monitor patient care processes and outcomes, support students' quality improvement projects, and provide an electronic portfolio in which students can display their best work and reflections

Each of these components is described along with examples from schools that are currently using these pedagogies.

Patient-Driven Learning

In an ideal world, students would begin medical school with an assignment to a primary care clinic one or two days a week and to a primary preceptor for at least one year, and much of the learning would be driven by patients seen in that clinic. Students would develop a panel of patients that might continue with them throughout the first three years. In this longitudinal clinical experience, students would work in the clinic and periodically participate in immersion experiences of one to two weeks' duration in a hospital environment.

In such clinical settings, pedagogies of practice would offer students opportunities to repeatedly practice clinical skills and procedures with more time, less risk to the patient, and more immediate feedback. When working in clinics, students would have formal and informal conversations with physicians, nurses, and even patients and families that can advance their conceptual understanding in ways that improve focused history taking, differential diagnosis, patient management and treatment decisions, and communication. Several well-researched and structured techniques, such as the One Minute Preceptor[75] or SNAPPS,[76] can help preceptors quickly gauge the learner's level of understanding and uncertainties, teach a general rule or principle, provide positive and corrective feedback, and stimulate reflection and self-directed learning.

For this approach to succeed, a new financial model and reward structure will be required for the teachers. The clinical time of the preceptors will need to be bought out to ensure it is adequate for clinical supervision, instruction, and tutorials. Faculty development will be critical to ensure that faculty members are knowledgeable

and skillful in teaching; and the academic promotion systems will need to recognize and reward this type of teaching. The Mayo Clinic has an exemplary system for faculty development and for reducing the clinical load for teachers. If physicians wish to teach, they must complete a series of faculty development workshops and then their productivity standards for patient care are reduced for teaching.[77]

Tutorials

Pedagogies that promote conceptual understanding are often found in classroom environments. Away from clinical settings, these pedagogies allow more in-depth exploration of topics at a more leisurely pace and an opportunity to explore ideas in greater depth. In a tutorial session, the underlying knowledge and skills needed for patient care can be analyzed, deconstructed, practiced, and recombined multiple times without the need of a patient. With the help of tutors, peers, and resources, complex content can be simplified and then elaborated. Students can be encouraged to read using a compare-and-contrast strategy; explore uncertainties; employ deliberate, conscious practice; and seek feedback on their performance.[2,3,8]

Tutorials provide ideal occasions to learn the basic, clinical, and social sciences associated with caring for patients and the basic skills needed to communicate with patients, such as taking a history and performing a physical examination. Two types of tutorials might be useful to achieve these learning goals: site-based and cohort-based tutorials. Site-based tutorials would be designed primarily to achieve the first goal: learning clinical knowledge and skills. Participants might include a preceptor and a third-year, second-year, and first-year student—all of whom are working in that practice. Learning in this site-based tutorial would be stimulated by the students' panel of patients and would allow each level of learner to contribute to the discussion based upon his/her own preparation and knowledge level. Typically, third-year students would lead the sessions even though a faculty member would be present and a curricular content guide provided for each session. This type of site-based learning currently occurs in longitudinal integrated clerkships and on many inpatient services during clerkship and residency training.

The second type of tutorial, created to explore basic, clinical, and social sciences relevant to medicine, would be a cohort-based tutorial session consisting of a small group of students at the same academic

level who would learn an integrated, structured curriculum appropriate for their level of understanding and competence. These tutorials would use a problem-based learning format or other patient-centered learning strategies to explore knowledge, skills, and professional values associated with the practice of medicine. In addition, labs and simulation centers would provide important opportunities for students to practice such skills as suturing and knot tying, pelvic exams, IV placement, and other clinical and procedural skills. Programs designed to enhance skill acquisition would include such educational components as deliberate practice with feedback, clear learning objectives, rigorous outcome assessment, and high achievement standards.[78]

These tutorials would be small, ranging in size from three to four students in the site-based tutorials to six to nine students in cohort tutorials. The rationale for learning in small groups is that students learn more when they are actively involved in constructing meaning and developing negotiated understanding of the content. When students are engaged in articulating concepts and applying content to patient problems, they discover the limits of their own understanding and develop more accurate representations of the formally structured knowledge to be acquired. Evaluations of small-group learning experiences in the sciences are consistently more positive than those acquired through lecture-based learning; small-group experiences promote persistence in learning and positive attitudes toward learning itself and the learned content.[79]

Some schools with limited facilities and faculties have found other ways to create small-group learning experiences in large lecture halls with a single faculty member.[80] This pedagogy, called team-based learning, involves assigning readings in advance and beginning each class session with a readiness assessment test—a short multiple choice exam that is scored immediately for each student to ensure adequate individual preparation. The test is then discussed in small groups, where consensus must be reached, and all group responses are tallied and discussed as a total group. Next, an application case is distributed and the small groups must select the best answer to the case. This answer is then reported out, tallied, and discussed as a total group. Studies of team-based learning have shown an increase in learning and subsequent performance on USMLE examinations.[81] Baylor University has been a leader in team-based learning

at both the preclinical and clinical levels. This instructional strategy is currently used in a small number of medical schools, and it is gaining popularity.

The key to tutorial learning is the active engagement of learners, the close connection to patient problems, and the opportunity to explore knowledge needed for the practice of medicine. Such small group learning is also the best environment for skill development, reflection, and professional growth.

Simulations

Simulation centers are high-technology environments that strengthen teaching, learning, and assessment through realistic simulations and team training for routine and complex situations, thereby improving patient care and safety. Simulation experiences range from the use of standardized patients to the use of mannequins and simulators. By virtue of the recording capabilities of many simulation centers, learners can observe, reflect upon, and critique their own performance afterward. Individuals and teams can rehearse, perform, and be assessed to ensure competence.

As speed and efficiency in the work environment increase along with demands for error-free patient care, clinical skills and simulation centers address this need by providing mastery-learning opportunities for skill learning. Programs designed to enhance skill acquisition include such educational components as deliberate practice with feedback, clear learning objectives, rigorous outcome assessment, and high achievement standards.[78]

Technology

Students at all levels expect to learn and work in Web-based instructional environments. Mobile devices, virtual worlds, and social networks are ubiquitous among today's students. Lecture casting, wireless access, technology-enabled classrooms, audience response systems, and electronic portfolios are becoming common in universities across the country. Student and faculty Web portals, secure data environments, email, and file storage, Web hosting, file sharing, blogs, and social networking are also increasingly the norm. Electronic course evaluations and online course management systems facilitate the instructional and evaluation processes.

Web-based modules provide learners with more flexible access to a wide range of instructional resources. Learners can cover the content at their own pace and explore content in greater depth and according to their interests and needs. Although the social context is less rich, some schools have developed virtual learning environments that allow students to raise and respond to questions and engage in discussions of the content in virtual and real time.

Scholarship of Teaching and Learning

This new model needs to exist in the context of a culture that values continuous learning and the scholarship of teaching and learning. The Carnegie Foundation for the Advancement of Teaching has done much to advance the scholarship of teaching and learning. In the landmark book, *Scholarship Reconsidered*, Boyer made the case for considering teaching as scholarship.[82] In the follow-up work. *Scholarship Assessed*, Glassick et al. articulated six assessment standards for judging all forms of scholarship: clear goals, adequate preparation, appropriate methods, significant results, effective presentation, and reflective critique.[83] More recently, Huber and Hutchings have argued in *The Advancement of Learning* the need for a communal space where faculty members can discuss teaching and learning, a place called "a teaching commons":[84]

> As *Scholarship Reconsidered* made clear, the professional responsibility of educators was to engage continuously in their own efforts to study the quality of their work, its fidelity to their missions, and its impact on students intellectually, practically, and morally.[85]

The challenge is to create a sense of community for teachers through which issues of teaching and learning can be dealt with in a scholarly manner. One approach that is growing in popularity is called the academy movement. Three essential characteristics of academies of medical educators distinguish them from faculty development programs:[86]

— A formal school-wide organizational structure that is separate from the dean's office or department with leadership provided by members of the organization

— Designated resources to fund mission-related initiatives

— Membership of qualified faculty educators identified through a substantive peer review selection process that values teaching, educational leadership, and educational scholarship

The oldest academy appears to be at the Medical College of Wisconsin,[87] yet there are over 30 academies at other universities and more are being created every year. All of these academies share some components of the mission to advance and support teachers, provide faculty development, promote curriculum improvement, and advocate for the teaching mission of the school and university.

Significant work has been expended on defining the scholarship of teaching and learning and developing guidelines for documenting teaching contributions for academic promotion purposes.[88] Each of the key roles of teaching can be accomplished in a scholarly manner: teaching, curriculum development, advising and mentoring, educational leadership and administration, and learner assessment. For faculty promotion purposes, documentation would include the quantity and quality of teaching and the evidence drawn from and building upon the work of others. Scholarship requires building on the work of others, public display, peer review, and dissemination. University promotion committees will need to incorporate these guidelines in order to reward and advance faculty members with major teaching responsibilities.

Summary

Innovations in medical education abound, but in the context of outdated curricular structures. A new model, rooted in the learning sciences, should guide the redesign of medical education. Drawing upon research from the cognitive sciences, workplace learning, inquiry and improvement, and professional formation, the new model of undergraduate medical education should consist of three years of balanced clinical immersion and formal tutorials, electives designed to instill habits of the mind for inquiry and improvement, and a fourth year that can be used for progression into residency training, remediation, career exploration, and/or scholarship. Pedagogies of engagement, comprehensive assessment, and a "teaching commons" would support this structure. This is a bold vision that is already being implemented in selected schools nationally.

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Discussion Highlights

THE STATE OF MEDICAL EDUCATION TODAY

Some schools are teaching about the healthcare system and problems within the system in the context of patients they see, simple things like how is the patient insured and what does it mean in terms of getting drugs for outpatient follow-up therapy. Understanding patients from that perspective makes a lot of sense.

We need to look at pre-medical requirements and our expectations when students come to medical school. Should we be looking at the prerequisites, and the way we structure admissions requirements and how that affects the ability to attract and recruit minority students? Does the science orientation of many admissions policies send the message that the hard sciences and math are prerequisites to being a good doctor, not some of the more humanistic and broadening elements of education?

We have to recognize that we allow individuals who have little insight into medical education to determine who remains in the pool to be considered for medical school. It happens as early as when they enter college, when inorganic and organic chemistry curricula look like college chemistry major courses. Institutions interested in rankings try to exclude as many as they can at this point to keep their acceptance rates as high as possible. So, someone else is actually making the decision about who goes to medical school years before they apply because they are being screened out as freshmen and sophomores in college.

The pre-med curriculum should be about learning for keeps, as opposed to learning to get a grade. We should think about what things can be done before someone actually arrives at medical school, and then count on it having been done. We have not been heavy handed in the way we approach the pre-med curriculum.

We need to look at our admissions criteria, and also at the MCAT, to see if we are testing whether people can think. Are we testing for the things we really want?

Because of the rigidity with which students approach pre-med, we lose a whole range of students who have the attitudes, beliefs, and values that support the kind of professionals we seek.

With the standardization and individualization issue you have a tradeoff. The broader the array of different backgrounds, the more challenging it is to create a standardized experience for the people who are going through.

When it was decided in the era of Flexnerian reform that organic chemistry and physics should be requirements, one could argue they were closely related to the current practice of medicine and level of discovery. We need to change those requirements because today organic chemistry and physics are far removed from the scientific principles we use in practice, but we do need to think about how to teach scientific reasoning to undergraduates.

We haven't talked about the importance of culture, the importance of aligning what we say with what we do, and the power of the unwritten curriculum.

I suspect very few clinical faculty are knowledgeable about adult learning, or pedagogy, or the ways they influence those whose education they are responsible for through things they say and do that go beyond their knowledge and technical competency.

The integration of basic science and clinical science is a long time coming and that archaic part one test really needs to be addressed, but the pressures for "I need a number" keep coming.

In nursing, studies show that the best prediction of our students' ability to pass the licensure exam is their science GPA.

If the ability to do quantitative and scientific reasoning is important to our profession, then why not require biostatistics instead of calculus? Some people say learning physics is as difficult as learning another language, so why not actually learn another language as part of our requirements.

I would like to see the accrediting bodies be flexible and willing to look at an idea that is different, but maybe doesn't meet a standard. A lot of what we did at our new school, and what we would have liked but chose not to do, happened because we had to meet all these standards.

We teach to different exams and build our curricula to those

standards. If there was a way that we could be more flexible, then I think we could get more creativity.

We teach science the way we always did. Our knowledge about social and behavioral determinants of health has exploded in the last 20 years, but I don't think many medical schools teach any of that. If you look at the data, up to 20 percent of avoidable mortality in the United States is directly related to risk behavior and genetics. We should be looking at the sciences that underpin what we know about what makes people healthy or ill.

One interesting notion is to move from the old image of medicine as a science-based profession to viewing medicine as a science-using profession. That would provide a better basis for judging what premedical education should and should not include.

The empirical emerging science base is going to make us think more like ecologists about the sciences and scientific perspectives that inform our notions of risk, survival, well-being and health, and the role of physicians and medical care.

IV.

Opportunities for Innovation at a Time of Expansion and Barriers to Innovation

Remarks

Darrell G. Kirch, M.D.
Association of American Medical Colleges

I was instructed to be provocative so I'm going to throw out a few ideas.

I want to return to the statement "this is not about the right number." I can't agree more wholeheartedly. Part of the reason why I agree is that I feel that I, and my Association, and others have been chastised because we've been caught up in the debate about the right number. We made a workforce statement in 2006 about expanding medical education, and much of the debate since then has swirled around "why is 30 percent right?" Why isn't 25 percent? Why isn't zero right, and so on?

One of my colleagues and I wrote a *JAMA* commentary (June 11, 2008—Vol. 299) that really mirrors this. It says there is no single variable that points us to a right number; this is an extremely complex, multivariate equation; there's no single variable; and many other factors come into play.

Maybe the AAMC should offer a *mea culpa* for our mistake in the '90s when we did focus on one variable, which was that the world is going to go to tightly managed care and therefore we're going to have a doctor surplus. We paid a big price for that simplified thinking. The point is that other things have to come into play. It's an issue of supply and demand, and my commentary explains what the other supply and demand variables are.

It's clear other things have to come before we attempt to figure out how to shape the workforce. Many of you said that we need to know what the care model is going to be, that there's no way to make that care model work unless you have a payment system that's aligned with it and that supports it. Only then can we talk about what our educational system needs to be and what our workforce needs to be. If we just talk about how many of X or Y or Z of that specialty or that health discipline we will need, we're lost. We have to think about these other things first.

I've been struggling with the question of whether we are focused, as the title of our meeting says, on medical schools, or are we look-

ing beyond? I think that actually illustrates one of our problems. If there are these phases—premedical, medical school, residency, fellowship, and practice—part of our problem is that we treat them as disconnected compartments. In fact, some of them even have sub-compartments, like the first two years of medical school and the second two years. Not only are there individual compartments, but there are doors between the compartments. One door is marked MCAT, one door is marked USMLE step one, and so on up to the boards. That kind of discontinuous thinking, with doors that have to swing open between each compartment, has restricted us in an interesting way. I want to talk about how I think it's restricted us in innovation.

I have been impressed by the amount of innovation in medical education that is going on. I have a chance to visit many institutions and all I see are interesting projects, but often they are highly focused innovations in one of those compartments. I'll give a few examples I know. The AAMC is working with Howard Hughes Medical Institute to determine the right science base for medical school and how that might influence the MCAT, but the work is focused on that gateway between a premedical curriculum and the first two years of medical school. It has not been focused on what kind of doctor you and I want taking care of us decades down the line. It has been limited to two of these compartments and the gateway between them.

We've talked about diversity. A focused innovation that my predecessor, Jordan Cohen, conceptualized and spearheaded, called Aspiringdocs.org, this year has the first matriculating class that showed results. I think it's a key reason why we had a 10 percent increase in Latino matriculants to medical school. We now can track people who were supported by the Web-based tool and entered medical school, so it has been a very focused intervention that yielded results. An innovation like the UC Irvine School of Medicine bilingual emphasis is a targeted, focused intervention that's going to yield benefits, and there are more.

A little more subtle is a focused innovation in medical schools to analyze funds flow and try to do mission-based budgeting, so you can actually show where there are educational dollars how they should flow to educators—a radical notion, but it actually was a

targeted way that helped us. White coat ceremonies, too, were an innovation. When I was a medical student, they didn't exist. Now, it's hard to find a school that doesn't have one. It's an innovation to instill humanism in the entering medical student that's wonderful, but it's very targeted at the few weeks at the beginning of medical school.

Figure 1

Mental Model for Implementing Innovation in Medical Education

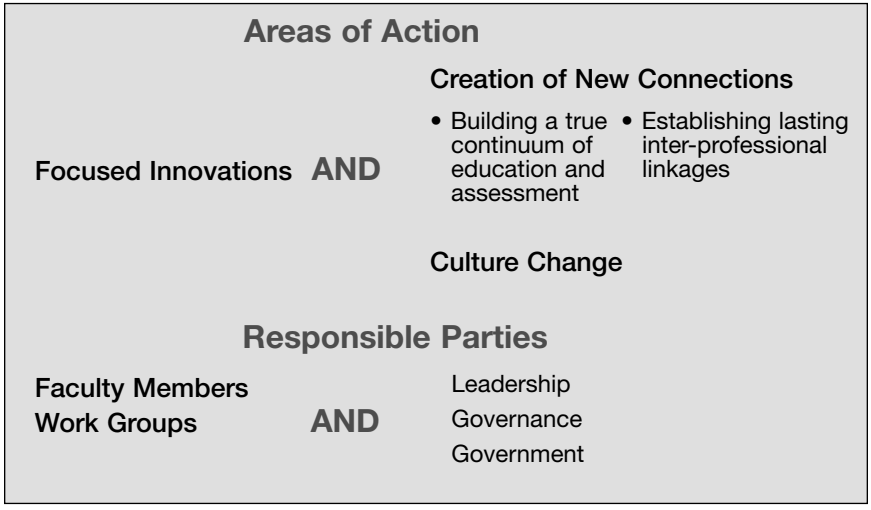
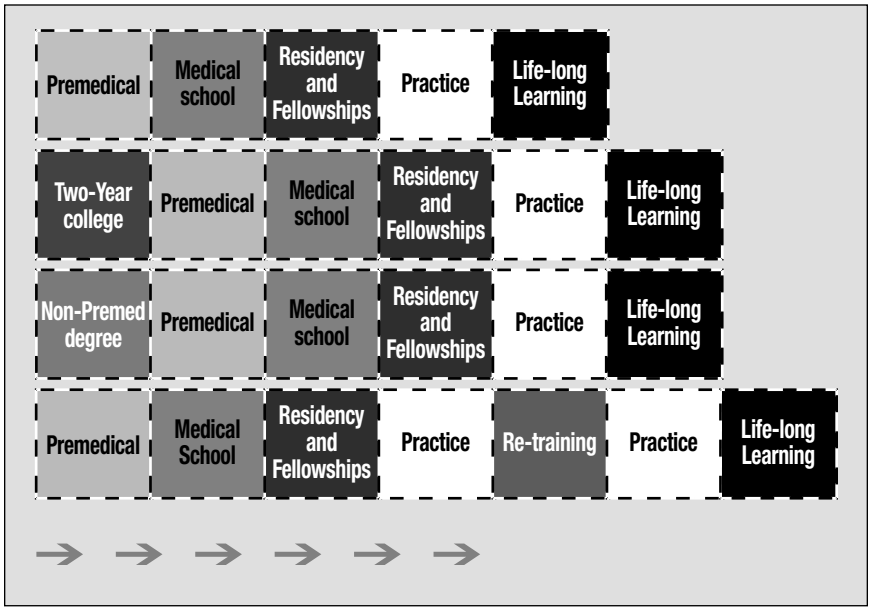


Figure 1 attempts to answer the question of how do we connect the dots? We keep producing more dots. My goal in thinking about this was how do they fall together? What is a framework we can use for putting our discussion into better coherence?

If you look at the areas of action, I would argue that most of our energy in medical education has been on the side that says "focused innovations." ACGME develops core competencies. We've all worked within our usual span of control to do something new and innovative. I hope we can move over to some of the things on the right-hand side of the "and," and that we transcend a loose collection of focused, compartmentally isolated innovations. We need to do a couple of things if we want to create traction.

On the right are two general areas: creation of new connections and culture change. Talking about new connections, I refer you to ***Figure 2***, which is a multi-line diagram.

Figure 2
In Search of Transformation — New Models of Continuity for the People



This is what it would look like if we stopped viewing the medical education world as a series of four disconnected, one-size-fits-all compartments with a rigid gateway between each. We should start to look over on the right-hand end of practice and life-long learning and let that better inform what we do on the entry end of premedical curriculum and admissions. If we started to think in that continuous way, we might actually realize that one size doesn't fit all. As an example, look at the bottom line. When somebody needs to retrain, they generally reinvent the wheel. There's no clear standardized pathway for people who've left practice and want to reenter, but given that we have more and more people doing that, don't we need a system that acknowledges that's going to happen a lot and streamlines it?

Under "new connections," the idea of not just paying lip service to a continuum of education, but starting to design ways so that the MCAT isn't only influenced by the first two years of medical school and USMLE step one, but is equally influenced by what we want in a practicing doctor. The whole admissions process should be influenced that way, and I believe that's what we're driving for. We need flexibility in the size of the compartments—acknowledging that different individuals may require different lengths of time in each compartment. Suddenly we start thinking with a flexible worldview.

If we did that, I think we could go to the other kind of connections. That is, if out in the world of practice, patients expect a supportive team and a medical home, we need to figure out how to work with other disciplines in a more rigorous way. The linkages between professional disciplines still need a lot of work.

The other item on that right-hand side of ***Figure 1***, culture change, is near and dear to my heart. I believe in the notion that culture trumps strategy. Having been a dean in two institutions and head of a health system, I found the biggest obstacle was culture. ***Figure 3*** describes the traditional culture, reinforced by traditional funding and the life of climbing the faculty ladder. This culture does not give the patients what they want, which is the emerging culture, as

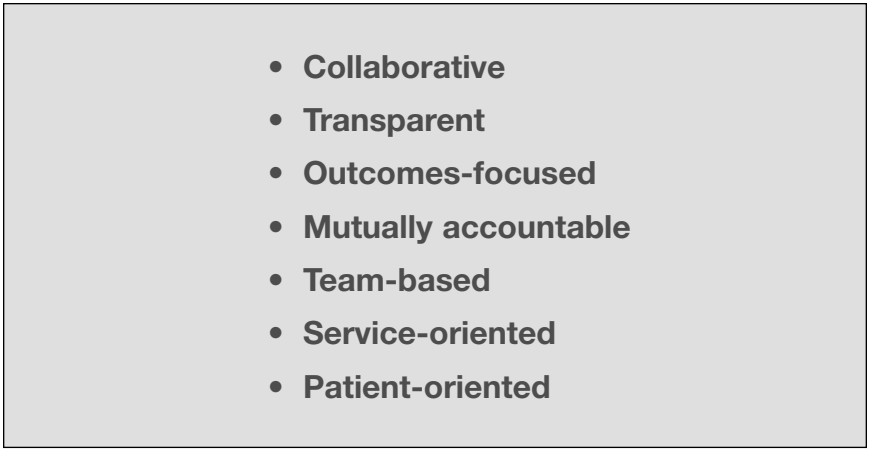
Figure 3

The Traditional Culture of Healthcare

- **Individualistic**
- **Autonomous**
- **Scholarly**
- **Expert-centered**
- **Competitive**
- **Focused**
- **High achieving**
- **Hierarchical**

Figure 4

The Emerging Culture of Healthcare



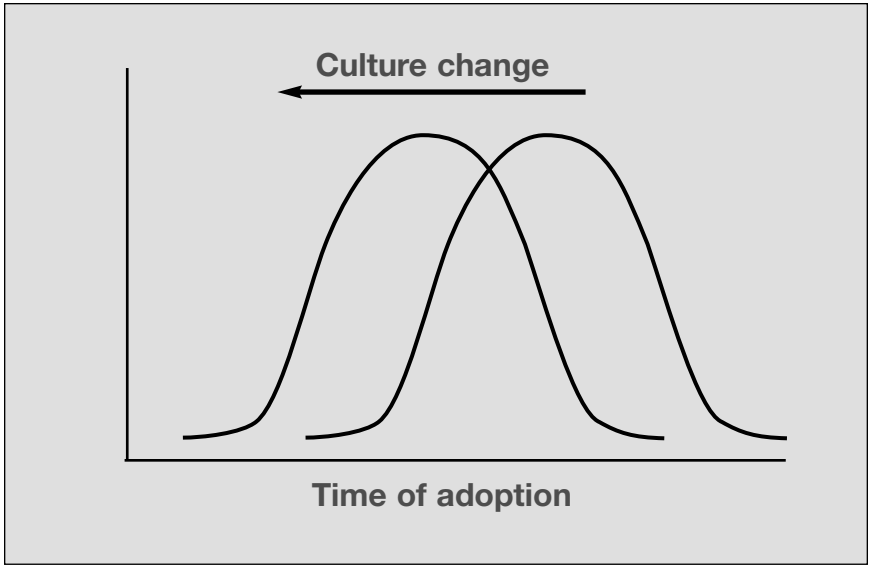
shown in ***Figure 4***. I don't see us devoting much energy to this. The average institution puts 100 times as much energy into its strategic plan to raise revenue as it does into its plan to get across this cultural divide.

Now, the reason I stress culture is illustrated by the famous curve about adopters of innovation ***(Figure 5)***. My theory is that if we really want to create more educational innovation, we want to shift the curve to the left. We want to create an earlier point of adoption of much needed innovation. Culture change has the greatest potency for shifting that curve to the left. If, for example, you want us to accept the power of informatics and being connected 24/7, it doesn't gain much traction in a culture of independent contractors, all of whom are free agents. But you do have traction if you have a culture of shared accountability and interdependence. So, if you shift the culture the curve moves to the left, and suddenly the adoption of IT innovation becomes easier and more effective.

The last point is the bottom section of ***Figure 1***, where I outlined responsible parties. We all focus on the two groups at the left, faculty members and their committees and task forces, and say "if they were just more innovative, if they were just more creative, we'd get to where we want to be." This is probably the most provocative thing I will say: I believe that our failures to really move innovation

Figure 5

Culture Change as the Key to Shifting the Adoption Curve



forward and create the kind of connections and culture change we need actually are shared failures of the responsible parties on the right. I think they represent a combined failure of leadership in our institutions and our organizations, leadership on our boards, who should be driving this, and a failure of government, which has moved away from feeling some responsibility for these things. We'll miss the mark if we just focus on the areas of potential action and we don't identify the parties responsible for carrying it out.

I was a medical school dean and I know it's too easy to criticize the faculty as the rate-limiting step. I'm more and more inclined to think maybe we need to look at the leaders on the right-hand side and ask if we are doing enough to enable the new connections and the culture change.

Discussion Highlights

OPPORTUNITIES FOR INNOVATION AT A TIME OF EXPANSION: ADMISSIONS, CURRICULUM, CAREERS

While we care very much about our students, our residents, and our systems, the reason we are here is to care for the health of the public, individuals, and communities.

Why are we afraid of inter-professional linkages? Is it because we're afraid that physicians won't have jobs, or that care to the patient will be worse.

I think fear of inter-professional linkages is primal, a fear of losing power. In some ways medicine, which traditionally has had more power, is most susceptible.

Part of the problem is that new ideas are happening in small areas, with discrete experiments, and we are not getting any kind of systems change.

If managed care had happened, we might be thinking much more about population health and health outcomes because that would be the incentive. We now have to deal with illness versus health.

Things like primary care have been around since the teens or the 30s. Early work with primary care health centers has come and gone and come and gone. Every ten years these things cycle. What causes something to catch and what causes something to have to be reinvented?

How can we move from continuing education to continuous education? And how can that be built into the habit formation of medical students so they don't always take comfortable courses? The way medical education is structured, the first time students get to choose a course is in the fourth year and then they pick among the things they are good at to get those important letters of recommendation for residency.

We have a long tradition of speaking for the poor without ever

speaking with the poor. We need a way for patients at the greatest risk of not getting good healthcare to tell us what kinds of doctors they need. If we can help create doctors, medical students, and residents who meet that need, the rest of society will get along fine.

Everyone is talking about the tests that they take, but we all know that knowing doesn't translate into doing.

The culture we'd like to move away from is the history of NIH and grant development, and the incentives that were provided to develop faculty promotion structures and individual accountability as opposed to team accountability. To get that big picture to change, we have to think about big incentives, something that will get institutions to move.

Even for groups not funded, the CTSA (Clinical and Translational Science Awards) have helped organizations rethink both the way they work together and their relationships to the community. Just writing proposals creates new kinds of relationships, and that happened because leadership, governance, and government dangled something that was so attractive that people started trying to do things in new ways.

It would be great to try to break down the barriers, but when you look at the ingrained nature of GME and hospitals, and the funding differences, then at how much financing they get from the government, you realize the only way it is going to happen is with major top-down guidance and oversight.

We create new curricula and we create new expectations, but the structure and priorities of medical education remain the same. Without really changing some basic structures, are we just fine-tuning?

The Alliance for Physician Competence is the best real world example of thinking about medical education as a real continuum. What distinguishes it is that it has brought actors together across the continuum and it started with the end, which is called a Good Medical Practices document, in mind. It has forced lots of organizations to think backward, so it's sharpened the discussion of what is the real bioscience foundation for a good doctor and what does that say about premed courses. It has not been easy. The biggest obstacles have been expertness and eminence. In some cases it has been

you're not the boss of me, in some it has been money, or you're threatening the scope of my practice, you're threatening the test I own. It has become a real world laboratory for going beyond focused innovation to connections.

We should consider ways to accelerate change. I think it is going to require regulation, particularly when we talk about diversity and other issues that might not be appealing incentives to organizations.

We should consider requiring our medical schools, GME programs, and undergraduate premed programs to work in consortia to look at the continuum of competency achievement and the thresholds for transition from one to the others. If people don't sit in the same room, you're never going to get there. Right now we have no vehicle to address the continuum of medical education that really works.

One of the overriding things we think about is how to encourage critical thinking and systems thinking. Right now we do a really poor job. The way we teach and the hierarchical model that we cling to discourages critical thinking. It's more like we want to mold our students to be like us, not that we want them to be like they should be, or to be better than us.

One of my pet peeves is the rounding process. Think of it from the patient's perspective. This huge group of people in white coats comes into your room and talks about you in a language you don't understand. My mother would have called it blatant rudeness, but we call it medical practice. It's bad for patient care, it's bad for interprofessional education, it's bad for teamwork, and it probably doesn't do a whole lot for morale.

The accelerating tendency of multiple professions to seek training at the doctoral level means that now many people are practicing in the domain that used to be considered medical practice. On the practice level, many professions want to populate the land with doctoral level people for all of the reimbursement and prestige factors that go with it.

To effect changes that will move us in the direction we want will require partnerships and changes at the governance level of professions and institutions, and involving accrediting and licensing bodies and partnerships between the various components of the

educational continuum. All this must be done with an eye to greater cost efficiency, which means evaluating not only what enhancements need to come in, but also what needs to come out.

I'd like to see explicit discussions between the osteopathic and allopathic accrediting bodies, between the two professions, and maybe between the GME level folks, targeted at the issues we've been talking about. Each body could learn from the other.

If we agree that there's a societal mission to medicine, and if we agree that mission is being hampered by medical education debt, I would recommend that we have an organization, or an entity like AAMC or ACOMAS, study whether we can cap debt at whatever that number would be.

I'd like to make a modest proposal that we outlaw the MCAT exam and all premed requirements so we could create an admissions system from scratch. In Northern Ontario, we did not require the MCAT and our premed requirements were simply if you majored in science, please take some humanities, and if you majored in humanities, please take some science. The effect was the largest aboriginal entering class in the history of Canada. It opened up an entire pool of people in underrepresented minorities in rural disadvantaged areas, a pool of what turned out to be very qualified older adults who come from those backgrounds that we're missing.

I would like to end the MCAT as the be all and end all of admissions and the fuel for the tyranny of *U.S. News* rankings.

The concept of workforce offers a strong incentive for us to have enough providers, and that means there's incentive to open this narrow neck of the bottle applicants must pass through to medical school. It means deemphasizing the MCAT and finding other ways of looking at applicants.

By individualized sub-specialist learning, we're perpetuating the traditional culture. How do we keep the notion of individual development, but balance it with team leader development?

If we create a situation where the barriers to accessing medical care, the barriers to going into areas where there are fewer physicians, and the barriers to going into primary care are lower, will people

start to make the right decisions, the ones that we think are socially responsible?

To what extent can a community invest in medical students so that students feel connected to that community and want to return to the people who supported them?

Maybe you could go through your medical training, and after you match into your specialty get a bill for the cost of your medical education. We can't equalize the pay all professionals get, but if we look at this as a capital investment, maybe the investment should be comparable to the expected return.

Some issues, like workforce diversity and the social mission of medicine, are too important to let wax and wane with the political climate.

We don't feel a sense of urgency, yet we know the American community doesn't have healthcare and that we work in academic health centers where we know the reliability of the care we provide is not good.

Why aren't we talking about designing models of care that will provide better access and better quality and reduce the cost of care, and preparing people to work in those models of care? Instead of having a nursing model and a medical model and an osteopathic model, we ought to have a patient-centered care model.

As a nation we spend twice the money on healthcare compared to any other nation, only to get the worst results in the industrialized world. We have disparities, we have an unpaid national debt, and unpaid obligations. People in academic medicine say we have the best medical education system in the world. Maybe we do, but we're not educating for this reality.

I am struck by the amazing amount of innovation that is going on, but nobody knows about it. We ought to recommend that there be a center for health professions educational research to guide and capture this wonderful, diverse innovation.

It's going to take effort to engage governance in a meaningful way. University presidents rely on a huge amount of opacity around

finances and they are scared of the risk of running these large businesses of health systems. Association statements talk about their social missions but they tend to think more like trade unions or guilds, and often the issue is what do our members expect us to defend.

When you get to the board level, they're not interested in all these social issues. Given the other fiduciary issues they view themselves as having, especially the overriding financial fiduciary duty, they view these greater social goods, if not as a threat, certainly not as a priority.

With Title VII, we have a vehicle that is identified with this community, one that is on the books, one with a proud history, which is tattered at the moment.

The way we have M.D. schools and public health schools does us a disservice. It creates this idea that you can either be a physician or a public health professional. I think every physician should be a public health professional.

We need to broaden the vision of the health professional to include not just care of the individual patient but the needs of the community and what health means.

We need discussion about the composition of the team, the skills of various team members, and how we can assess personal excellence and excellence in functioning as a member of a team, always with the goal of improving both the quality and safety of patient care.

We need to encourage flexibility in movement across boundaries, not only from UME to GME, but also from residency to fellowship, and to encourage fast tracking where appropriate.

The unifying factor for all these new schools is financial problems. Every one of them is going to be on a tight budget with limited resources trying to be ultra creative. One thing not likely to make the critical list is the expertise to turn these experiments into research, so we'll have lots of observational reports with little outcomes research.

It is hard to think about innovations in the curriculum when we still have these specific hurdles that come at a particular calendar time in

the curriculum.

We have to see these new schools and the expansions as a phenomenally complex set of natural experiments. We need a way to see the results of all the different changes. That might be the thing we regret if we don't have one in place.

We need to concentrate on four or five themes, not just open the doors for innovation. One is diversity and multiculturalism, another the issue of preparation of the pre-medical student, then what is the responsibility at the undergraduate level for producing a product that's ready to be a first-year house officer in a given specialty, and how do we approach the expanded portfolio of competencies from individual to collective responsibilities. We need to be more focused because we can't solve every problem by asking medical schools to innovate, and we may cause more problems than we solve.

Maybe we could create an advisory board for the new schools that are starting from scratch, with representatives from the accrediting bodies to help oversee the innovations and allow these schools to innovate from pipeline to admission to medical school curriculum to residency and specialty.

BARRIERS TO INNOVATION

Our lack of knowledge about long-term outcomes, about what happens when you do something upstream to the physicians who are produced later, is a major obstacle. One idea has been for a Framingham-type study for medical education that would take large cohorts, sample different kinds of venues, and then do longitudinal follow-up.

We've had this experiment with community-based medical schools going on for a long time, and nobody seems to be saying that the people who came out of those medical schools were not competent physicians.

We can't measure ourselves effectively and have comprehensive health professions education reform without some kind of national

health professions workforce planning. There is also a need for a center for national health professions workforce education research, which would be a long-term repository of data.

The focus for a center on medical education outcomes should be on how to make doctors better doctors and whether we're addressing our social responsibility to deliver trained doctors to the places where they are needed.

One of the barriers we've got, and it is omnipresent, is the morale of the medical profession. There are generational barriers and I don't know which generation is the problem. Overall, you have dissidents and that affects morale.

Ultimately we're going to be inhibited from real creativity by what's on the test, which is what each next step values when it admits students to that level. You cannot create a curriculum that disadvantages your students. If the top residencies continue to value scores and research productivity, and could not care less about communication skills and understanding the healthcare system, and the students want to succeed, that is going to be a big barrier.

We're not going to get new GME slots. The graduates of these new schools are not going to be the ones who are squeezed out. It will be the international graduates and the U.S. students who are studying abroad. The tendency will be not to supply workforce to underserved areas, since they are more likely to go to those areas than U.S. citizens trained in the U.S.

If we just produce more of the same and they locate themselves in areas of high intensity resource utilization, we'll exacerbate the cost effectiveness of practice and we'll exacerbate the equity and distribution problems.

Would the current medical education leadership advocate for more money for medical education over more money for NIH, or higher reimbursement for Medicare? There needs to be a sense of new political will and policy priority for medical education. If the leaders did that, it would get attention.

One of the biggest barriers is the whole issue of commitment at the governance level. Our organizations and the structure of the educa-

tion process is change averse because there are so many different parties involved, and a lot of people like it the way it is.

We began a college of pharmacy and deliberately planned modules where medical students and pharmacy students work together. One substantial barrier is the interpretation of accreditation standards. Accreditation standards in medicine get in the way. We need leadership to encourage accreditation bodies not to change standards but to interpret them in ways that allow innovation to occur.

One of the rules about reengineering is if you don't have committed support from the top, don't even start.

One problem is the leadership of medicine has never been so fragmented, and that's a real obstacle right now.

One thing that contributes to LCME being viewed as a barrier is the widely disparate way different site visitors interpret requirements. You're vulnerable to a sort of Russian roulette of who actually visits your school.

On the whole, LCME has been an incredible asset to the new schools.

One reason accrediting bodies don't put best practices on a website is because those in the field believe their implementation of what is on the website satisfies our requirements. That is not necessarily true because it may be an adaptation unique to a given location.

Conference Conclusions and Recommendations

After two and a half days of discussion, participants agreed to the following conclusions and recommendations:

CONCLUSIONS

Crisis in Healthcare

Healthcare in the United States is in trouble. More than sixty million people are uninsured or underinsured. Healthcare costs continue to escalate faster than the rate of GDP growth. Health outcomes, patient satisfaction, and quality indicators in the United States are all worse than those of most developed nations. Compounding these difficulties, unconscionable health disparities exist between poor and rich, uninsured and insured, and minority and majority populations.

The U.S. Physician Workforce

The United States is likely to face a significant shortfall in the number of physicians needed for the future. Although that shortfall is difficult to quantify,[i] it is abundantly clear that substantial qualitative changes are needed in medical education to better prepare future physicians for the challenges ahead. Among those changes are the expanded range of competencies that all physicians must have in order to meet the needs of a rapidly evolving healthcare system; the woeful lack of adequate racial and ethnic diversity in the physician workforce; and the persistent geographic and specialty maldistribution of physicians.

The State of Medical Education

Although medical educators have implemented countless curricular and pedagogical innovations over recent decades, medical education has not kept pace with the growing public expectations of physicians or with the novel demands of an increasingly complex healthcare system. As a consequence, medical students too often graduate without all of the knowledge and skills that 21st century physicians need and without fully appreciating the role that professional values and attitudes play in sustaining medicine as a moral

i The ongoing expansion of medical school capacity will not result in a larger physician workforce unless the number of residency positions also increases. Absent a parallel expansion of GME, increasing the number of U.S. medical school graduates will only serve to reduce the number of graduates of foreign medical schools who enter residency training in this country but will not increase the number of physicians entering practice in the United States.

enterprise. To address current shortcomings and achieve better alignment with societal needs and expectations, medical schools will need to modify both the content and the processes of their educational programs, and to give greater priority to the teaching mission of faculty. In addition, medical schools will need to take concerted actions to ensure that the learning environments in which students are immersed reflect the professional attributes espoused in the classroom. Medical students acquire their professional identity and standards of behavior largely as a consequence of the role models they encounter in the course of their education. Too often the lessons students learn from the powerful "hidden" or "informal" curriculum experienced in the course of their education not only fail to reinforce but also serve to undermine the school's expressed commitment to inculcating high standards of professional behavior.

Finally, attention must be given to the prevailing cultural norms that exist in far too many institutions, norms which can be aptly described as individualistic, autonomous, expert-centric, and hierarchical. Such cultural attributes are increasingly at odds with those known to be conducive to delivering high-quality healthcare: namely, collaborative, mutually accountable, patient- and community-centric, and outcomes focused.

This Moment in Time

The need for action is urgent and compelling. This time of expansion in medical school enrollment provides an unparalleled opportunity to re-examine longstanding assumptions in medical education and to encourage focused innovation that will better prepare students to meet the needs of the American people. Efforts to improve must span the continuum of medical education—from premedical education, through undergraduate, graduate, and continuing medical education—with careful attention to the transitions between those stages.

To accomplish this task, institutional leaders and governing bodies must become visibly and actively engaged in the improvement process. The assistance of federal and state governments as well as private foundations will also be required.

This period of expansion in enrollment must not result in "more of

the same." Failing to take full advantage of the opportunity afforded by this "natural experiment" to advance the mission of medical education for the benefit of the public would be tragic.

RECOMMENDATIONS

The expansion of medical school enrollment for the first time in more than 30 years provides an extraordinary opportunity for all schools to reassess their educational programs to assure that they are meeting the health needs of society. This opportunity is particularly propitious for new schools and those opening new 2- or 4-year branch campuses, but also should be seized by established schools, whether or not they are pursuing enrollment growth.

Regarding Institutional Leadership and Governance

— Medical school deans, as well as presidents and governing boards of parent institutions, have a clear role and responsibility in affecting needed changes and must exert strong leadership in facilitating, and participating in, the change process if the sought-for improvements in the institutional culture are to occur.

— In order to achieve the core educational mission of their institutions and meet the health needs of the public, institutional leaders and governing boards should be comprised of men and women from all racial and ethnic groups in American society.

Regarding the Core Mission of Medical Schools

— All medical schools have an obligation to educate future physicians who are prepared both to assess and to meet the health needs of the public. This obligation entails:

- ensuring that all medical students retain their enthusiasm for medicine and remain committed to its societal missions
- fashioning educational experiences that enable all students, whether intending careers in practice, research or administration, to acquire the knowledge, skills, attitudes and behaviors of true professionals
- providing a physician workforce drawn from all sectors of American society
- educating medical students who are prepared to choose careers

as generalists and specialists in adequate numbers to address the full range of patient needs in all geographic regions of the country

- fostering greater inter-professional teamwork and collaboration

Regarding Medical School Admissions

— To ensure access to high-quality health services for everyone, medical schools must broaden the definition of merit in determining who is qualified for admission to the profession.

— Medical schools must reduce their reliance on standardized tests, college grade point averages, and traditional undergraduate course requirements in selecting applicants for admission. Although these factors can predict success during the first two years of the traditional medical school curriculum, they fail to assess the full range of attributes required of fully competent physicians. Medical schools must employ a more balanced, comprehensive set of admission criteria in order to attract, matriculate, and support students who, in addition to the requisite intellectual skills, have the maturity, judgment, and commitment to serving others required to meet public expectations and needs.

— Medical schools also must develop and utilize more effective methods than those currently employed to enlarge and diversify the pool of applicants for admission.

Regarding the Debt Burden of Medical Students

— Medical schools must find ways to substantially reduce the level of student debt. For example, schools should consider:

- making additional funds available (e.g., from endowments, alumni giving) for needs-based scholarships
- organizing the curriculum to allow students the option of meeting graduation requirements in three rather than four years
- advocating the creation of more state and federal programs that provide substantial debt forgiveness in return for a period of public service
- ensuring that all students receive appropriate counseling for minimizing and managing debt
- capping tuition at current or reduced levels

Regarding Innovations in Medical Education

— To address recognized shortcomings in traditional models of medical education, all medical schools should update their curricular content and implement, evaluate, and disseminate innovative pedagogical approaches that enhance student achievement of learning objectives.

— All medical schools should ensure that students become familiar with critical subject matter not yet incorporated sufficiently in the typical curriculum. Examples include:

- knowledge and skills for improving the quality of patient care and enhancing patient safety
- application of information sciences and systems thinking
- principles of public health and prevention
- role of non-biologic determinants of illness
- health implications of cultural diversity
- organization, financing, and performance of the healthcare system
- creation and impact of governmental health policy

— All medical schools should adopt promising pedagogical innovations to enrich the learning experience for students. Examples include:

- underscoring the relevance of "basic science" topics by integrating preclinical and clinical education throughout the curriculum
- employing novel models of clinical education that:
  - epitomize inter-professional, team-based care
  - incorporate extensive community as well as hospital-based experiences
  - enable longitudinal patient and faculty relationships
- using computer- and mannequin-based simulations for education and assessment
- applying e-learning and other information technologies to

augment traditional methods of instruction and to develop skills for life-long, self-directed learning

Regarding Medical School Faculty

— Medical schools should recruit and support men and women faculty members who reflect the ethnic and racial diversity of the American population.

— Medical schools and their faculty must assure that all learning environments exemplify and nurture the development of positive professional values. To this end, faculty must:

- embody and express consistently the professional values and competencies expected of medical students
- engage in effective professional development activities

— Medical schools must assure that faculty are recognized and rewarded, financially and otherwise, for excellence in teaching, mentoring, and inter-professional activities, and that career pathways for medical educators are supported.

Regarding Standard-Setting Bodies

— The agencies responsible for accrediting allopathic and osteopathic medical education at both the undergraduate and graduate levels should promote innovation across the continuum. The Liaison Committee on Medical Education (LCME), the Commission on Osteopathic College Accreditation (COCA), the Accreditation Council for Graduate Medical Education (ACGME), and the Council on Osteopathic Postdoctoral Training (COPT) should:

- begin promptly to share information with one another
- collaborate to assure maximal flexibility in designing and implementing accredited undergraduate and graduate education programs. This flexibility is particularly important for the LCME and COCA in fostering innovations in new, applicant schools, and schools undergoing significant expansion
- foster team training and the efficient use of faculty and clinician resources across the professions
- develop methods to disseminate information about innovative programs

— Those responsible for high-stakes tests and evaluations (i.e., for admission, licensure, and certification) should make certain that their assessments are aligned with educational objectives throughout the continuum of education.

— The Association of American Medical Colleges (AAMC) and the American Association of Colleges of Osteopathic Medicine (AACOM) should accelerate their efforts to assess (a) the relevance of traditional course requirements for admission to medical school and (b) the elements of the MCAT examination and its role in the admission process.

Regarding Government and Private Entities

— The federal government should:

- greatly expand existing forms of national service for health professionals, especially the National Health Service Corps (NHSC), and develop additional programs of national service to help address societal needs
- recast the role of and increase the investment in Title VII to support innovations and research in health professions education
- authorize and support a collaborative body to assess the country's health workforce and recommend policies for meeting future health workforce needs

— Public and private entities should be encouraged to:

- provide funds to document and evaluate the outcomes of the current medical school expansion efforts
- fund a national center or institute to disseminate successful innovations and support research in health professions education

Biographical Sketches

Joseph R. Bettancourt, M.D., M.P.H., teaches cross-cultural medicine, health disparities, and health policy to medical students and residents at the MGH-Harvard Medical School and to students at the Harvard School of Public Health. He currently co-chairs the Massachusetts General Hospital Committee on Racial/Ethnic Disparities and the Harvard Medical School Cross-Cultural Care Committee, and has published numerous peer-reviewed articles on topics including racial and ethnic disparities in health and healthcare, workforce diversity, and the impact of language barriers on health care.

Jo Ivey Boufford, M.D., is President of the New York Academy of Medicine. She also is Professor of Public Service, Health Policy and Management at the Robert F. Wagner Graduate School of Public Service and Clinical Professor of Pediatrics at New York University School of Medicine. Previous experience includes service as Principal Deputy Assistant Secretary for Health in the Department of Health and Human Services where, among her duties, she represented the United States on the Executive Board of the World Health Organization. She currently serves as Foreign Secretary of the Institute of Medicine.

Jordan J. Cohen, M.D., President Emeritus of the American Association of Medical Colleges, is Professor of Medicine and Public Health at the George Washington University School of Medicine. As President, Dr. Cohen's achievements at AAMC included strengthening services for medical students, residents and constituents; strengthening communications, advocacy and data gathering; and establishing initiatives to improve medical education, research, and patient care. He has held faculty positions at Harvard, Brown, and Tufts universities. Current board positions include the Josiah Macy, Jr. Foundation, the Morehouse School of Medicine, and the National Medical Fellowships,

Ellen M. Cosgrove, M.D., is Senior Associate Dean for Education at the University of New Mexico School of Medicine, where she also is Professor of Internal Medicine. Her academic interests include assessing medical professionalism, addressing healthcare disparity through curriculum design, primary care and community-based education, and innovations in problem based learning and medical education technology. In her position, Dr. Cosgrove is responsible for undergraduate, graduate, and continuing medical education. She has received numerous awards and honors for her long-time work in continuing medical education. She is a member of the board of the United States Phamacopeia.

Linda Cronenwett, Ph.D., R.N., is the Dean and Professor of the School of Nursing, University of North Carolina at Chapel Hill, and Associate Chief Nursing Officer for Academic Affairs at the University of North Carolina Hospitals. A member of the board of directors of the Institute for Healthcare Improvement and the Robert Wood Johnson Foundation's Transforming Care at the Bedside national advisory committee, she is also principal investigator for the Quality and Safety Education for Nurses initiative, funded by Robert Wood Johnson. She has served on numerous editorial advisory boards and her recent publications have focused on preventing medication errors, and safety and quality education for nurses.

Cam E. Enarson, M.D., M.B.A., Professor of Health Policy and Ethics and Anesthesiology at Creighton University, served as the Vice President for Health Sciences and Dean of the School of Medicine from 2003-2008. An expert in both medical education and business, he has published numerous articles on medical education. He recently completed six years as a member of the Liaison Committee on Medical Education and currently serves as an at-large member of the National Board of Medical Examiners.

Lewis First, M.D., M.S., Chairman of the Department of Pediatrics at the University of Vermont College of Medicine and Chief of Pediatrics at Vermont Children's Hospital at Fletcher Allen Health Care, also serves as Senior Associate Dean for Medical Education. In that role, he has been responsible for the implementation and evaluation of the school's new "Vermont Integrated Curriculum," an integrated, competency-based, patient and family-focused undergraduate medical school curriculum. The recipient of numerous teaching awards and honors, Dr. First also serves as Deputy Editor-in-Chief of *Pediatrics,* is Senior Co-Editor of the next edition of *Rudolph's Pediatrics,* and offers medical advice to parents on "First with Kids" several times a week on radio. television and in community newspapers in Vermont.

Deborah C. German, M.D., is founding Dean of the College of Medicine, University of Central Florida. She leads development of a full-scale medical school and academic medical center that is part of an evolving research-based medical city in central Florida. The new college already has received provisional accreditation from the Liaison Committee on Medical Education, and enough money has been raised to provide full four-year scholarships for the entire Charter Class. Prior to her current position, Dr. German had served as Senior Associate Dean of Medical Education at Vanderbilt and was a Petersdorf Scholar at the Association of American Medical Colleges. She has received numerous honors and awards for her work in medicine and for her community contributions.

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Edward M. Hundert, M.D., has served as President of Case Western Reserve University, Dean of the University of Rochester School of Medicine and Dentistry, and Associate Dean for Student Affairs at Harvard Medical School. During his tenure at Case Western, the School of Medicine developed a multi-affiliate model for an academic medical center that involved the four competing health systems in NorthEast Ohio. At Rochester, he led the school's integration of basic and clinical sciences across the four-years of medical school. An internationally known academic leader, scholar, educator, psychiatrist, and medical ethicist, he has written extensively and served on numerous boards, including the Association of American Medical Colleges and the Liaison Committee on Medical Education. He co-chaired the Institute of Medicine's National Summit on Health Professions Education.

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Thomas J. Nasca, M.D., MACP, is Chief Executive Officer of the Accreditation Council for Graduate Medical Education. Earlier positions include President of Jefferson University Physicians and Anthony F. and Gertrude M. DePalma Dean of Jefferson Medical College. He is a past member of the Liaison Committee on Medical Education and currently serves as a member of the Board of Exchange Commission for Foreign Medical Graduates, the National Board of Medical Examiners, and the American Medical Association's Initiative to Transform Medical Education.

Cathryn L. Nation, M.D., is the Associate Vice President for Health Sciences in the Office of the President at the University of California. In that position she coordinates health sciences academic affairs and works with deans and faculty on education policy, program planning, and enrollment plans for the university's 15 health sciences schools. Other duties include monitoring the state's health professions workforce needs, overseeing the university's anatomical materials/willed body programs, and directing the state-funded, multi-campus Academic Geriatric Resource Program. She has written on medical and health sciences education and is lead author on the Institute of Medicine's national review of admissions practices in the medical and health professions.

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William M. Sullivan, Ph.D., is co-director of the Carnegie Foundation's Preparation for the Professions Program. This project is analyzing professional education for law, engineering, the clergy, medicine, and nursing in order to identify common themes and those practices that are distinct to different types of professional education. He is the author of *Work and Integrity: The Crisis and Promise of Professionalism in America* and a co-author of *A new Agenda for Higher Education: Shaping a Life of the Mind for Practice,* among others.

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