Ensuring an Effective Physician Workforce for the United States

Recommendations for Graduate Medical Education to Meet the Needs of the Public

The Second of Two Conferences—The Content and Format of GME
Chaired by **Debra Weinstein, MD**

May 2011 | Atlanta, Georgia

November 2011

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Recommendations for Reforming Graduate Medical Education to Meet the Needs of the Public

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PREFACE

GEORGE E. THIBAULT, MD

The keynote speaker at a 1992 Macy Conference on the state of graduate medical education (GME) in the United States called the GME issue "a hardy perennial," and observed that "its problems never quite get solved." It is true that calls for GME reform have occurred in every decade since the 1940s, and many of the specific recommendations in these calls for reform have not been enacted.

In the past decade, some changes have occurred: schedules have been modified to comply with duty-hour restrictions, the concept of competency-based assessment has been introduced, and some training has moved from the inpatient to the outpatient setting. But many observers of GME continue to feel that the pace of change is not sufficient to keep up with the rapidly changing needs of the patients we serve and with the evolution of the health care system our trainees are entering. For that reason more than 2 years ago a group of thought leaders began to meet to discuss how we might constructively address the issue of GME reform once again. The feeling in the group was that there was even greater urgency to this issue than in decades past because the rapidity of societal change compared with the slow pace of GME change had led to a misalignment between our educational products and societal needs, and without intervention that misalignment was going to become more profound. Subsequently, the national debates on health care reform and budget deficits have only added to the urgency of these issues.

We decided to plan two conferences to address different aspects of this complex GME issue. The first conference was held in October 2010. It was cosponsored by the Macy Foundation and the Association of Academic Health Centers (AAHC), and it addressed the financing and regulatory issues related to GME. The thought leaders who had had initiated this GME discussion served as the planning group for that conference, and the results of that conference have now been published as a monograph entitled *Ensuring an Effective Physician Workforce for America: Recommendations for an Accountable Graduate Medical Education System*.[1]

1 Josiah Macy Jr. Foundation. *Ensuring an Effective Physician Workforce for America, Recommendations for an Accountable Graduate Medical Education System.* Proceedings of a Conference Chaired by Michael M.E. Johns, October 2010; Atlanta, Georgia. New York: Josiah Macy Jr. Foundation; April 2011. Available online at: http://josiahmacyfoundation.org/publications/publication/proceedings-ensuring-an-effective-physician-workforce-for-america

The premise that guided the consensus recommendations of this conference is that GME is a public good that is significantly financed with public dollars and therefore must be accountable to the needs of the public. The recommendations called for a high-level review of the finances and governance of GME in order to have a system that is optimally responsive, flexible, and innovative and that has the appropriate incentives to meet the needs of the public.

This report deals with the second conference, which focused on the structure, content, and efficiency of the training process itself. There was intentionally some overlap in the participants in the two conferences, but the second conference was enriched by the addition of many educators across disciplines and from many different institutional types and locations. If the goal of the first conference was to help construct a system that is more accountable, the goal of the second conference was to provide a more detailed road map of how individual programs can and should change in this accountable GME system.

As background, the conferees had the four commissioned papers and six presentations from the first conference. There were two additional papers commissioned for this conference: "The History of Calls for Reform in Graduate Medical Education and Why They Have Failed," by Kenneth Ludmerer, MD, and "Theory and Practice in the Design and Conduct of Graduate Medical Education" by Brian David Hodges, MD, PhD, and Ayelet Kuper, MD, M.Ed, D Phil.

The participants met in plenary sessions and breakout groups for facilitated discussions on each of the major topics of GME content and structure. The highlights of these rich discussions are captured in the monograph. These discussions led to a series of conclusions and recommendations that are reported here in detail with accompanying rationales and requirements for implementation.

Given the size and complexity of the issues discussed, it is gratifying that consensus was reached on so many points with such a degree of specificity. Having participated in many GME discussions in the past, I felt this was the most thoughtful, deep, and comprehensive review of the terrain that I have experienced. All the conferees came prepared, participated fully, and engaged in an intense but respectful discussion.

The five major reforms called for are:

1 Greater accountability through public representation and public reporting

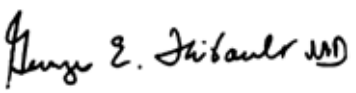
2 Greater relevance through broadening sites and content of training and requiring interprofessional education.
3 Greater efficiency through adopting a competency based approach, and eliminating non educational experiences and redundancies in training
4 Greater flexibility to individualize training for different career goals
5 Greater research base to improve and evaluate training

The conclusions and recommendations do provide the road map we had hoped for to better align GME with contemporary needs. Not every recommendation will be applicable to every program, but every program can and should find relevance in the recommendations. Some recommendations will require regulatory changes, but many can be enacted without other changes if institutions and programs have the will to do so.

This final summary of the report captures the sense of urgency the conferees expressed at this critical juncture in the history of health care in this country: "GME reform is imperative if we are to have a more robust, reliable and efficient health care delivery system…. It is critical that all GME stakeholders recognize both the urgency and the opportunity of reform. Failing to accomplish necessary change will leave an enlarging gap between society's needs and what the graduates of our GME system can provide."

The changes that are recommended can only be accomplished with the thoughtful guidance of the profession. By doing this we can and will earn continued support for the investment in GME as a public good.

I want to thank Debra Weinstein for her superb leadership of this conference from the planning stage through publication of this monograph. I also want to thank the planning committee for their high degree of involvement and many contributions at every stage, and all the conferees for the energy and intellectual investment they made in the conference and for the wisdom and guidance they provided. Finally, I want to thank Nick Romano for his tireless efforts that brought all this together.



George E. Thibault, MD
President, Josiah Macy Jr. Foundation

INTRODUCTION

DEBRA WEINSTEIN, MD
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VICE PRESIDENT FOR GRADUATE MEDICAL EDUCATION
PARTNERS HEALTHCARE SYSTEM, INC.

MUCH HAS CHANGED, YET MUCH REMAINS THE SAME...

Many individuals involved in GME will assert that fundamental change has already occurred. After all, the unscripted immersion in patient care that used to characterize residency training has been replaced by a competency-based curriculum. The off-hand "call me if you can't manage" has given way to prescribed supervision. Expectations that residents work without any bounds on their job description or on their hours have been curbed by rules protecting the work environment and limiting duty hours.

These and other improvements in GME reflect that teaching institutions have assumed greater accountability for the quality of GME, and greater responsibility for the physicians being educated and the patients they treat. However, because change has occurred through regulation, rather than by community conviction or tangible incentives, progress has been limited. Continued resistance to competency-based education, supervision, duty hour limits, and other initiatives prevents their more complete implementation. In fact, it's fair to say that more change has occurred on paper than in practice.

Indeed, the approach to training and the actual experience of today's residents and fellows remains quite similar to my education 25 years ago. GME remains heavily reliant on inpatient care, even as health care is predominantly—and increasingly—delivered in non-hospital settings. The process and duration of GME have not been systematically examined, even while health care delivery is being reengineered and cost-reduction efforts focus on reducing patients' length of stay. Completion of GME is still linked to a defined period of training rather than a formal skills assessment. It's also notable that in most teaching settings physicians learn and practice *alongside* nurses and other professionals, rather than *with* them.

THE MACY FOUNDATION'S GME PROJECT

The May 2011 conference, entitled "Ensuring an Effective Workforce for the United States," was the second of two linked conferences seeking ways to better align GME with the needs of the public in the context of a rapidly evolving health care system. This conference focused on the content and format of GME and delivered recommendations that converge on a few key themes:

- Broader input into GME planning and greater transparency of GME outcomes are needed;
- Greater diversity in the sites and content of GME, with expanded collaborative education across specialties and health professions, will strengthen education;
- Enhanced quality and efficiency in GME should be pursued by prioritizing the most educationally rich experiences and by reexamining the transitions into and out of GME, the duration of training, and the criteria for completion;
- Evidence-based GME requires more research focused on health professions education.

By describing the rationale for each recommendation, and in some cases suggesting ideas for implementation, we hope to persuade colleagues, regulators, and consumers of health care and medical education that these changes can and should be accomplished.

GETTING FROM HERE TO THERE: A CALL TO ACTION

What is needed to make these recommendations a reality?

1 *Further input from the broader GME community and from the public.* The participants in this conference were impeccably qualified, highly engaged, and broadly representative—but could not include all the many deep thinkers, influential leaders, and creative individuals involved in GME. Broader and more detailed discussion is needed to refine and build on these recommendations, and to translate them into actionable proposals.

2 *Revision of ACGME, ABMS, and CMS requirements that limit experimentation and innovation.* Regulatory organizations must also more rapidly shift their emphasis from process to outcomes and decrease the burden of documentation, which currently diverts time and attention away from education.

3 *Development of national criteria and standardized tools for assessing physician competency.* Implementing competency-based graduation, evaluating new curricula and training sites, and pursuing other conference recommendations require validated and broadly accepted means of measuring the outcomes of GME.

4 *National mechanisms for funding and facilitating research on health professions education, and for coordinating GME reform efforts.* Implementation of pilot programs will allow for different approaches to be compared; outcomes analyses will need to be shared broadly.

Now the work begins!

CONFERENCE SUMMARY

Graduate medical education (GME), the training of physicians between medical school and independent practice, has been criticized in the United States for not adequately preparing physicians for their future practices and for not being sufficiently responsive to the needs of society. Although notable changes have occurred in GME over the past decade, including the introduction of a competency-based framework and limitations on duty hours, many people feel that much broader reforms are needed to keep pace with changing patient demographics, the evolution of health care delivery, the need to use health care technologies more effectively, and the demand for a more efficient, cost-effective health care system.

A COMPELLING NEED FOR GME REFORM

Many prior calls for GME reform have failed to produce meaningful change. Now, however, a convergence of forces makes a more compelling case for accelerating reform. The first force is the changing demographics and disease burden of our patient population. The population over 65 years of age is expected to double by 2030, and octogenarians are the fastest growing subgroup. People are living longer, with more chronic diseases and an increasing incidence of concomitant medical, cognitive, and functional issues. The epidemics of obesity and diabetes have added to the chronic disease burden. Also, our population is more ethnically, racially, and culturally diverse and will become even more so in the decades ahead. Changes in demographics and disease patterns and increasing health disparities create new health care needs, requiring new approaches to physician education that emphasize collaboration, communication, and transitions in care.

The second force is the transformation of our health care system, which was well underway prior to the passage of the Patient Protection and Affordable Care Act. Care delivery and technology continue to move out of the hospital into other facilities, the community, and the home. Care is commonly provided by teams of health professionals, who are assuming new roles. The Affordable Care Act will accelerate these changes and, by extending health insurance to 32 million more Americans, will put stress on the system and create a demand for new delivery and payment models while addressing the desirable goal of improving access to care. Our trainees must be prepared to work in different organizations and sites of care and in teams of health professionals. They will need the skills to work in and lead an evolving health care system.

The third force relates to the explosive growth in health care technology and our need to use these technologies with optimal efficiency and safety for patients. Advances in medical diagnostics, therapeutics, and information technology can significantly improve health outcomes. However, we have fallen short in consistently using technology optimally to improve the quality and efficiency of health care. We need to train the next generation of physicians to optimally use medical and information technology, to follow the principles of quality improvement and patient safety, and to practice medicine based on the best evidence.

The fourth force is the unsustainable growth in the cost of our current health care system. Total health care expenditures were $2.5 trillion in 2009, representing 17.6% of the gross domestic product. The next generation of physicians must help to create a more efficient health care system that is sustainable and affordable. Physicians in training must understand the financial implications of their patient management decisions, and their training must include new and efficient models of care so that they will be prepared to practice cost-effective medicine and be responsible stewards of resources while providing high-quality patient care.

In addition to these external forces, there are stimulants for reform from within GME. Educators are struggling to maintain the quality of GME amid growing tension between work-hour restrictions and the need for sufficient clinical experience to develop expertise. At the same time, educators are working to protect precious curricular time from the encroachment of non-educational tasks. Program directors and teaching faculty also find it increasingly difficult to provide trainees with sufficient independence to support their advancement, especially in procedural specialties.

Alongside these external and internal forces that challenge the traditional content and structure of physician training are concerns that the GME system is not training the right specialty mix or number of physicians to meet society's needs. A previous Macy conference report ("Who Will Provide Primary Care and How Will They Be Trained?") called for a greater investment in primary care. However, trends in physician training are moving in the opposite direction. In the past decade, the number of residents in subspecialty training has risen five times faster than the number of residents in the core specialties (those representing primary board certification). The number of residents expected to practice primary care has declined by more than 10%, and the number of residents in other core specialties in which a shortage is predicted, such as general surgery or psychiatry, is unchanged or has decreased.[1]

Predictions of physician workforce needs have a poor track record for accuracy. However, the current demographics of our general population and of the physician workforce make a shortage of physicians in the near future very likely. While estimates of the magnitude of the shortage vary widely, many predict it will be in excess of 100,000 physicians by the middle of the next decade. Changing care models, new roles for other health professionals, improved efficiency, and alterations in physicians' career decisions could mitigate this predicted shortage but are unlikely to eliminate it.

Of course, GME reform cannot solve all of the problems of the health care system. Physician specialty and location choices are determined by many factors that are outside of the control of GME, such as the admissions policies of medical schools, the magnitude of indebtedness of physicians upon graduation, and the monetary and non-monetary rewards of practice in each specialty. While the GME system does not control all of the variables affecting the size and composition of the physician workforce, it does have a profound influence on physicians' attitudes and skills through program design, sites of training, role modeling, and mentoring. Positive or negative experiences during residency have an important influence on physicians' ultimate career choices. In addition, GME is responsible for the efficiency with which it produces physicians who are ready for practice. In preparing physicians for independent practice, the GME system and its component programs must be dually accountable to the trainees entrusted to them and to the public.

1 Cronenwett L & Dzau V. In: Culliton B, Russell, S, editors. Who Will Provide Primary Care and How Will They Be Trained? Proceedings of a Conference Sponsored by the Josiah Macy Jr. Foundation; 2010; Durham, N.C. Josiah Macy, Jr. Foundation; 2010.

The public expects the GME system to produce a physician workforce of sufficient size, specialty mix, and skill to meet society's needs. Many observers from both public and professional vantage points feel it is currently falling short in each of these dimensions.

DEVELOPING RECOMMENDATIONS FOR REFORMING GME IN THE UNITED STATES

Concerns about the status quo, the convergence of forces demanding change, and the importance of GME to our health care system led the Josiah Macy Jr. Foundation to undertake a major initiative on GME reform. GME is not a single entity, but rather is the sum total of the accreditation and certification organizations, regulatory bodies, sponsoring institutions, individual programs, faculty, and academic leaders that together prepare physicians to practice in the United States. The conclusions and recommendations that follow are addressed to these various participants in the GME system.

These conclusions and recommendations are the result of the second conference on GME reform sponsored by the Macy Foundation, convened to focus on the content, structure, and format of the GME system. Our conference built upon the recommendations of the conference held in October 2010 ("Ensuring an Effective Physician Workforce for America: Recommendations for an Accountable GME System"), jointly sponsored by the Macy Foundation and the Association of Academic Health Centers (AAHC). That conference, chaired by Michael M.E. Johns, MD, Chancellor of Emory University, addressed the funding and regulation of GME.[2] Guided by the principle that GME is a public good that must be accountable to the needs of the public, those conferees made five major recommendations:

1. An independent external review of the goals, governance, and financing of the GME system should be undertaken by the Institute of Medicine, or a similar body.
2. Accreditation policies should enable GME redesign.
3. The funding of GME should be re-examined to assure there will be an adequate number of physicians.
4. Mechanisms should be established to fund innovations in GME.
5. An immediate increase of 3,000 entry-level positions in targeted core residencies should occur, with subsequent changes based on accurate workforce assessments.[2]

2 Michael M.E. Johns, Chair, Ensuring an Effective Physician Workforce for America, Proceedings of a Conference Sponsored by the Josiah Macy Jr. Foundation, held in Atlanta, GA, Oct. 24–25, 2010; New York: Josiah Macy Jr. Foundation; 2010

The second conference took place in May 2011, with Debra Weinstein, MD, Vice President for Graduate Medical Education at the Partners Healthcare System, as the chair. The invited participants came from all regions of the United States and from Canada, and reflected multiple specialty backgrounds. They represented a range of experiences in GME at the individual program, department, medical school, regional health system, and national levels. Conferees participated as individuals and not as representatives of any organizations.

The group was charged to build on the recommendations from the first conference. Participants were asked to take a societal perspective (rather than a purely institutional or professional perspective) in assessing the current state of GME programs and recommending changes. They were urged to think broadly about the optimal state of GME in general rather than for an individual specialty.

The conference featured topical discussions around the content and structure of GME. Each section included a plenary session to highlight the issues, breakout groups for in-depth discussion of specific questions, and reports of potential recommendations for consideration by the entire group. Further discussions identified areas of concordance among breakout group reports, examined disagreements, and explored new ideas. This process led to a series of consensus conclusions and recommendations on how GME should be reformed to better meet the needs of the public.

The public good was the foundational consideration in assessing the current state of GME and the lens through which all proposals for change were viewed. Selected background material and two commissioned papers helped participants begin with a common frame of reference, and the rich experience of participants informed the deliberations. The result was a strong call for change with concrete recommendations aimed at strengthening the alignment of GME with societal needs in order to better prepare an effective physician workforce for the future.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion I » GME must meet the needs of—and be accountable to—the public.

The programs, institutions, accreditors, educators, and regulators that together comprise the GME system hold collective responsibility and accountability for GME.

Recommendation I-A » To respond effectively to society's evolving health care needs, GME must create and maintain a dynamic, ongoing exchange with the public through appropriate partnerships that engage communities in feedback, analysis, and planning.

- Individual institutions sponsoring GME should engage one or more member(s) of the public to serve on the GME committee, such as a public member of the institution's board of directors. Expanding the perspectives "at the table" will provide new insights into both problems and solutions.
- National GME organizations [such as the Accreditation Council for Graduate Medical Education (ACGME), American Board of Medical Specialties (ABMS), American Osteopathic Association (AOA), and Association of American Medical Colleges (AAMC)] should strengthen engagement with consumer organizations, patient interest groups, policy makers, and other representatives of the public. This could be accomplished through increased representation of members of the public on the boards of GME-related organizations, and through greater participation of organizations representing the public in GME meetings.

Recommendation I-B » Evaluation of GME at the institutional and national levels should be transparent.

- Training programs, sponsoring institutions, and accreditors should publicly report GME outcomes based on nationally agreed-upon metrics. National organizations involved in regulation or oversight of GME should also report relevant data.

Recommendation I-C » The GME system should be proactive in responding to and anticipating significant changes in health care delivery and practices.

- Principles of continuous quality improvement should be applied to GME at the institutional and national levels. GME should be both nimble and flexible in striving to enhance the quality and outcomes of education.

Rationale

GME is responsible for upholding a social contract with the public it serves. GME

benefits from significant public funding and must demonstrate a clear return on society's investment. GME is responsible for self-monitoring and largely self-regulating its professional outcomes; to do this responsibly, GME must have ongoing dialogue with key stakeholders in order to understand society's needs and its expectations of individual physicians and the medical profession as a whole.

It is no longer sufficient to say that producing competent physicians meets GME's responsibility to the public, though graduating skilled practitioners and verifying their competence to undertake independent practice are fundamental requirements. The GME system must also be a responsible steward of public funds and ensure that the process of education is efficient, cost-effective, and evidence-based. Finally, GME must address society's health care needs in terms of the number and specialty distribution of physicians.

Currently, GME's structure and content are shaped by teaching hospitals and professional organizations, influenced by institutions' needs to provide care, and constrained by organizational silos and some degree of competition between medical specialties. The voice of the public in GME planning and assessment would help ensure that GME's goals are continually reaffirmed and that GME programs are designed to achieve these goals.

Conclusion II » High-quality GME requires experience with a diverse mix of patients, clinical problems, and health care delivery mechanisms to support a curriculum that addresses evolving patient, population, and health care system needs and expectations.

Recommendation II-A » The sites of training should expand to reflect current and future patient care needs.

Special attention should be paid to non-hospital training sites, though some programs may need to incorporate greater exposure to technology-intensive, high-acuity settings.

- Individual sites should be selected based on demonstrated patient care quality and educational merit, as measured by teaching effectiveness (including the quality, ability, and commitment of educators); a learning environment characterized by professionalism, effective communication, and adequate supervision; the necessary educational infrastructure; and, importantly, quality

patient care. If available sites do not reflect these characteristics, then such sites must be developed.

- GME sites should include the breadth of settings where physicians in the given specialty provide patient care. In addition, because all clinicians, including those in hospital-based specialties, receive patients from and discharge them back to non-hospital care settings, all trainees must have experience in outpatient settings and care sites outside the medical center where their residency is based. The selection of sites and the amount of time allocated must be appropriate to the specialty.
- GME sites should incorporate established and emerging models of health care delivery (such as medical homes), provide meaningful experience in team-based care and population health, and incorporate new technologies such as electronic health records and telemedicine.

Rationale

The GME curriculum is delivered primarily through the residents' participation in supervised clinical activity. Residents can develop only a theoretical appreciation of patient problems and settings of care to which they are never exposed. Many reports indicate that physicians are not fully prepared for practice at the completion of residency training. Because less care is delivered in hospitals, which are the predominant site for GME, it is urgent to diversify training sites to provide the necessary breadth of clinical experience. In addition, many settings in which residency education currently occurs do not have the attributes required for effective learning. For example, some settings in which residents see outpatients are chaotic, offer poor continuity with patients, or do not afford developmentally appropriate supervision.

Requirements for Implementation

GME funding mechanisms must support GME programs when trainees are assigned to non-hospital training sites.

Faculty development (i.e., training physicians as educators) and evaluation of faculty are necessary to ensure that all training sites have committed faculty who are knowledgeable and skilled in state-of-the-art educational practices.

Additional Notes

- Appropriate training sites should be determined based on a common understanding and expectation about future health care delivery models and an analysis of their implications for education.
- Examples of new sites include community-based clinics or physician groups, community hospitals, long-term care facilities, chronic care sites, patient homes, hospices, work- and school-based clinics, and federally qualified health centers. Other new sites could be population specific, such as prisons, homeless shelters, or global health sites.
- Aggregate outcome measures of the institutional quality of care and the population health of its surrounding community should be developed and reported publicly so that GME can, over time, be concentrated in sites with excellent outcomes, and so that the relationship between teaching activities and patient/community outcomes can be studied.

Recommendation II-B » The content of training should expand to include topics essential for current and future practice, particularly those related to professionalism, population medicine, and working effectively in the health care system.

- Enriched educational content in these areas, along with engaging teaching and learning strategies, should be meaningfully integrated into GME programs in all specialties, and the impact on physician behaviors and quality outcomes should be rigorously assessed.
- The ACGME core competencies provide an effective framework for this expanded curriculum but must be better integrated with clinical performance. GME programs must assess resident performance with respect to these competencies in various care settings and stages of development using national standards. (Applicability of this recommendation to the competency domains of the AOA should also be evaluated.)

Rationale

As noted previously, physicians require new skills to care for an aging patient population with increasing complexity, amid a growing array of diagnostic and therapeutic options and an urgent need to contain cost. The ACGME core competencies have made progress in this direction, while also helping to

move accreditation toward a more outcomes-oriented approach. However, the competencies remain poorly standardized and incompletely assessed and are too often taught and evaluated outside the context of patient care.

Residency programs have had difficulty operationalizing the core competencies, in part because many of the teaching faculty do not really understand or embrace some of the competencies and associated curriculum. Thus far, many GME programs have done little more than include new topics in the didactic portion of the program; delivering this content only through a lecture series is not effective.

Requirements for Implementation

Teaching methods and assessment tools will need to be developed, validated, and disseminated on a national level for consistent use in GME. Faculty development in these topic areas will be essential. Residency Review Committee site visits and related paperwork will need to more directly assess outcomes related to the core competencies.

Additional Notes

- Education in the area of professionalism should include diversity and cultural competence, teamwork, leadership, ethics, social responsibility, conflict management, methods for lifelong learning, personal accountability, and physician well-being.
- Population-focused content should include preventive medicine, community health, and socioeconomic determinants of health.
- Topics critical to effective functioning within the health care system include quality and safety, cost-effective care, health information technology, and remote medical care.
- Self-awareness and critical evaluation of one's own performance, collaborative participation in inter-specialty and inter-professional teams, dealing with complexity and ambiguity, societal responsibility, and cost awareness are increasingly important and must be emphasized within the current competencies or as new competencies.
- A refinement of the core competency framework should be influenced by other successful models. For example, the CanMEDS construct developed by the Royal College of Physicians and Surgeons of Canada gives a more holistic and integrated view of the roles physicians must master.

Recommendation II-C » Education should occur across historic professional boundaries to consistently incorporate inter-specialty and inter-professional education into GME. All residents should have opportunities to learn with and from physician colleagues in other specialties and from other health professionals.

Rationale

Patient care, particularly for older individuals and those with complex problems, increasingly requires effective collaboration across medical specialties and the various health professions. Joint educational activities can establish the foundations of effective, patient-centered, team-based care. Current medical education inculcates physicians with a "captain of the ship" attitude, which can impair inter-professional collaboration. To counteract this tendency, GME should incorporate a respect for the expertise of other health professionals and foster the development of sophisticated teamwork skills; residents should participate in substantial clinical and non-clinical educational activities with learners in the other health professions.

Inter-professional and inter-specialty education can also be an effective way to address curricular topics that are relevant to all health care providers, offering improved teaching efficiency and the richness of varied perspectives.

Requirements for Implementation

Regulations (of state licensing boards, ACGME, or other organizations) prohibiting supervision across specialties or professions will need to be revised where they present obstacles to inter-specialty or inter-professional education. Likewise, billing requirements may need to be revised to avoid penalizing a responsible caregiver who is supervising, confirming, or supplementing the care given by an appropriately credentialed caregiver from another specialty or discipline.

Additional Notes

- Collaborative education should be incorporated into patient-based education in both traditional (hospital and ambulatory clinics) and non-traditional (e.g., home hospice) settings, for example, through collaborative practice, multidisciplinary rounds, and case-based conferences. Additional non-clinical integrated educational activities could include quality improvement projects and simulation-based team training.

- Inter-professional education and inter-specialty physician education will likely be most effective when learners are brought together at appropriately matched levels of professional development so that their knowledge and experience allow for a similar level of discussion, learning, and participation in patient care.
- In some instances, potent inter-professional education may need to involve supervision across disciplines, as appropriate to the nature of the activities being supervised.

Conclusion III » There is both need and opportunity for greater efficiency in delivering GME. Accomplishing this will also help to address national physician workforce needs, while enhancing the quality of training.

Recommendation III-A » The length of GME should be determined by an individual's readiness for independent practice—demonstrated by fulfillment of nationally endorsed, specialty-specific standards—rather than tied to a GME program of fixed duration.

Rationale

Residents vary significantly in how quickly they achieve competency, yet the current system of training all residents for a fixed duration fails to recognize or accommodate this reality. Residents who achieve competency more quickly than their peers must still complete the required period of training, which delays the "delivery" of competent physicians into practice and underutilizes the available pool of GME positions, which is an important societal resource. For residents who develop skills more slowly than their peers, program directors often see the planned completion date as an "up/down" decision, instead of tackling the cultural, regulatory, logistical, financial [as funding from the Centers for Medicare and Medicaid Services is based on duration], and other challenges to extend their training. Thus, routinely aligning the duration of training to individual residents' achievement of competence would support the following results: 1) a more consistent level of skill among physicians entering unsupervised practice; 2) more efficient delivery of competent practitioners to the public; and 3) more responsible use of public funding supporting resident education because more physicians could be trained for the same cost if the remaining funding for sufficiently trained physicians were redirected to the education of others.

Requirements for Implementation

- Residency programs will need the flexibility to accommodate varying numbers of residents or implement a system for filling slots as they become available, i.e., having new residents start at different times throughout the year. (Some anesthesiology programs, for example, already have multiple start and end dates to accommodate individual schedules. This plan could be implemented across specialties—especially in larger programs—to adapt to competency-based duration of residency or fellowship.)
- Nationally standardized assessment methods, using specific milestones (as per the "Milestones Project" now underway), will need to be developed and implemented in each specialty to determine when individuals have achieved the competence necessary for unsupervised practice.
- ABMS and AOA requirements will need to be revised to reflect eligibility for certification based on demonstrated competence, rather than completion of a fixed duration of training.
- Institutions that sponsor GME and external funders, including the government, will need to provide flexible funding to accommodate longer or shorter time periods needed for individuals to complete training.

Because implementation of recommendation III-A will require significant planning, recommendation III-B (below) is suggested as an interim approach.

Recommendation III-B » The defined period of general specialty programs required as a prerequisite to subspecialty training/practice should be evaluated and, where possible, shortened to improve educational efficiency. Opportunities for reducing the required duration of subspecialty fellowship training also should be explored.

All core specialties should define the clinical competencies essential for subspecialists who do not intend to also practice as generalists, and curricula should be revised to focus on these competencies, with a goal of reducing current 3- to 5-year "core" specialty programs by 6 to 12 months.

Rationale

GME is not optimally efficient: time is spent in non-educational activities at all levels of training, and this occurs to some extent in all specialties. Moreover, the

current duration of training is not evidence-based. Some specialties, including plastic surgery and thoracic surgery, have shortened the required training; radiology recently reconfigured to allow the final year of residency to focus on subspecialty rather than generalist training.

While training time might be shortened in many or all specialties, reducing the general specialty training of future subspecialists appears to be a logical first step to achieve greater efficiency. Because limits on duty hours have prompted some faculty, particularly in procedure-based specialties, to consider lengthening the training period, an across-the-board reduction of residency program duration is not recommended without further study.

Requirements for Implementation

- ABMS, AOA, and ACGME requirements will need to be revised to reflect the shorter period of generalist training defined for individuals pursuing subspecialty practice within certain specialties. This may require development of a certification status limited to the subspecialty area because the training will not be comparable to that received by generalists who then undertake subspecialty training.

Additional Notes

- Fellowship training can be shortened by distinguishing clinical and physician-scientist tracks and eliminating 1 or more years of required research for fellows pursuing a clinical career.
- Increased educational efficiency achieved through recommendations III-A and III-B has the potential to free up many residency positions within the GME "cap," which should be redirected to entry-level positions that address national workforce needs. We endorse the funding of a national workforce commission to guide the allocation of residency positions by specialty and geography to meet societal needs.

Conclusion IV » Medical education represents a continuum of lifelong learning. Phases and transitions between the phases of medical education should be examined with regard to coordination, efficiency, and appropriate performance assessment.

Recommendation IV-A » For all students a flexible but more rigorous use of the final year of medical school should focus in part on ensuring that the skills and intellectual, technical, and professional development necessary for entering the individual's chosen specialty have been achieved, thereby providing a better transition into GME. Students who have met appropriate milestones might graduate earlier from medical school and enter GME sooner.

Rationale

Many students use significant time in the final year of medical school to "audition" and interview for residency programs and pursue electives, rather than to strengthen their medical education or deepen their learning in a given area. Allowing capable medical students to graduate in less than 4 years after demonstrating "readiness" for GME will accelerate the point at which those physicians can serve the public and will mitigate the educational debt that many students carry.

Requirements for Implementation

- Specific skills expectations would need to be defined at the national level for entry into residency training in each specialty, along with methods for assessing achievement of these skills. As noted in Recommendation IIIA, the logistics of flexible residency start dates would need to be addressed so that positions will be available for medical students who progress to GME faster.

Additional Notes

- Expanding the number of programs that combine medical school and residency training into a shorter duration should be encouraged, and their outcomes should be studied.
- Where milestones have been developed and are met, opportunities to complete "traditional" medical school programs in less than 4 years should be more widely available. The outcomes of these students should be carefully evaluated.
- Regardless of the duration of medical school, the transition from medical school to GME should be marked by rigorous evaluation, documentation of skills required for GME, and close communication about the progress and performance of each new physician between his or her medical school and the GME program.
- Medical school and GME educators will need to collaborate on the development

of clear standards for communicating about student preparation for and performance within GME.

Recommendation IV-B » Independent preliminary programs, tracks, and positions should be eliminated. Instead, necessary prerequisite education should be incorporated into each core residency, giving the program director authority and responsibility for the curriculum, organization, and assessment of residents throughout their education in the specialty (thus eliminating unnecessary transitions within GME).

- The related training option of a "transitional year" residency, which has been used to serve a variety of purposes, should be studied to determine whether this option, likewise, provides sufficient value for society and for the trainees.

Rationale

Preliminary programs were designed to provide foundational education in general surgery or internal medicine as a prerequisite for residency training in other fields (such as anesthesiology, neurology, and ophthalmology). In recent years, several specialties have taken greater responsibility for their prerequisite training by incorporating it into a specialty-based residency (including anesthesiology, orthopedics, otolaryngology, and psychiatry). This integration has several demonstrated advantages, including the following:

- Delivery of a curriculum focused on the needs of the specialty.
- Eliminating an unnecessary transition between programs that disrupts the continuity in teaching, evaluation, and mentoring that is so important to professional development.
- Ensuring that trainees have sufficient skills as they take on higher-level, specialty-oriented patient care responsibilities.
- Enhancing educational efficiency by eliminating experiences that are not truly foundational to the resident's specialty.

Also, because preliminary programs are not shaped by detailed requirements designed for a specific specialty (as are the categorical residency programs within which they operate), their content and assignments are more likely to be influenced by non-educational factors, such as service needs or contractual obligations. Putting

this training within the purview of specialty program directors, and providing them with ultimate authority over educational content and supervision, would help ensure the quality of the experience.

Requirements for Implementation

- ABMS, ACGME, and AOA requirements will need to be revised to reflect that all training required for a given specialty be incorporated into that specialty's residency program.

Additional Notes

- Best practices can be collected and disseminated from specialties that have already made this transition as data become available.
- Program directors will need to work with each other across specialties to arrange inter-specialty rotations or other learning experiences within the specialty-based residency program.

Recommendation IV-C » A period of "monitored independence" must be provided within GME to confirm each physician's readiness for independent practice.

Rationale

If residents are not afforded sufficient independence or authority for patient care, they may be delayed in developing essential skills, particularly decision-making and technical skills, and may lack confidence in the competencies they have achieved. Program directors and teaching faculty express widespread concern that residents are not given sufficient opportunity to act independently within the present teaching environment and are consequently less well prepared for practice. These concerns are most strenuously voiced within procedure-based specialties but extend across multiple disciplines. Some attribute the increasing rates of sub-specialization to residents' insecurity about mastering the breadth of the specialty and their insecurity about readiness to leave the teaching environment without additional training.

Clearly, patient safety and the quality of care must be protected—and supervision is a key part of this—but the interests of current patients (cared for by the

resident) must be balanced against the interests of future patients (cared for by the newly independent physician that the resident will become). Within a teaching environment, the review of resident decisions and monitoring of patient progress allows for rapid intervention and "rescue" from suboptimal outcomes to a much greater extent than is possible in the settings where many new GME graduates will practice.

Requirements for Implementation

- Providing residents with a period of "*monitored independence*" before the completion of training will require close and thoughtful supervision throughout training. Direct faculty supervision constitutes a critical element of the education process; observation prompts immediate and specific advice and coaching that could not otherwise be provided. Close supervision is also needed to affirm readiness for monitored independence.

Additional Notes

- The specialty-specific "milestones" and "entrustable professional activities" now being defined by consensus committees in several specialties will provide an important framework for documenting progression throughout training toward competency and readiness for independence.
- Creating a short-term "junior attending" role to follow completion of training might fill a need of some physicians transitioning from GME to practice—especially those who will need to treat complex problems in settings where consultation or assistance from colleagues is not easily accessible. This would allow the new GME graduate to gain additional clinical experience as an attending physician in a consultative-rich environment. The role could also provide value to teaching institutions by allowing for flexible staffing through short-term commitments and an opportunity to "audition" potential future faculty.

Conclusion V » GME must be organized and supported at the institutional and national levels to ensure that residency and fellowship programs are 1) designed and conducted according to sound, broadly-endorsed educational practices, within an environment conducive to education, and 2) given sufficient flexibility to innovate and achieve optimal outcomes.

Recommendation V-A » Empowered educational leaders should ensure that the following educational principles and practices serve as the foundation of GME programs:

- The educational program must be intentionally designed to develop the knowledge, skills, attitudes, and behaviors required for successful current—and future—clinical practice.
- Sufficient continuity of patient care, direct observation, formative feedback, and mentorship are key elements of quality education.
- Autonomy of thought should be maximized throughout training. Autonomy of action should be earned through observed demonstration of clinical skills and professional behaviors.
- Educational value should be determined by how an experience moves the learner along the continuum from novice to expert. To maximize educational efficiency and outcomes, "high-yield" activities should be emphasized and supported. "Low-yield" activities should be identified and eliminated from the curriculum, despite historical or contractual obligations and financial obstacles.
- Regular, systematic program evaluation should be done to ensure continual improvement. This should apply to both accredited and non-accredited programs.

Rationale

The preparation of medical school graduates for independent practice relies heavily on experiential learning through meaningful participation in patient care. Residents and fellows need repeated deliberate practice of activities that constitute essential competencies. Thus, drawing a bright line between "service" and "education" invokes a false dichotomy. Nevertheless, it is clear that GME trainees are often assigned tasks with limited educational value, which then eclipses other, more educationally rich experiences.

Program directors and institutional GME leaders are primarily responsible for ensuring that the residents' activities advance curricular goals and that the necessary faculty, infrastructure, and other program elements are in place to support high-quality education. However, these educational leaders often lack the necessary authority to accomplish this goal. Meeting trainee, program, and societal needs requires that educational leaders are given sufficient authority and resources, along with the sustained engagement and support of their department chairs, deans, hospital presidents, and system CEOs.

Requirements for Implementation

- The leadership of institutions that sponsor GME [i.e., presidents, CEOs, deans, designated institutional officials (DIOs), and department chairs] must be accountable for the quality of GME. GME metrics should be included among the criteria by which institutional leaders are assessed and their incentives and rewards are determined.

Additional Notes

- Institutional leadership must ensure that GME leaders, including DIOs and program directors, are given sufficient authority and resources to ensure high-quality educational programs, including the authority to determine the sites of training and select the teaching faculty.
- Institutional and GME leadership must together ensure that an environment supportive to education is maintained.

Recommendation V-B » Flexibility should be allowed and encouraged at both the program and individual trainee levels to enhance training for the varied physician roles required to meet the full spectrum of society's health care needs.

- GME programs should have flexibility to tailor their education to specific careers or practice settings as long as they ensure that residents receive effective training to achieve clinical competence, as defined nationally for the given specialty and as assessed by standardized tools. For example, individual programs may wish to enrich their curricula and resident activities to emphasize rural health, global health, physician-scientist, or other career development areas, and to recruit trainees with compatible career goals and faculty with expertise in these areas.
- Residents and fellows should have flexibility to individualize their training toward specific career goals as long as the required elements of clinical competence are achieved as defined nationally for the given specialty and as assessed by standardized tools. This goal can be accomplished by allowing trainees to relinquish an activity after its educational goals and associated clinical and professional competencies have been achieved in order to pursue other educational goals.

Rationale

The predominant model of "one-size-fits-all" GME, reinforced by current certification and accreditation requirements, aims to ensure consistent clinical skills development but at the same time inhibits the development of individual or program-based areas of expertise. Society needs physicians who will devote themselves to the care of patients in different settings—some in academic medical centers and others in underserved areas such as rural health clinics; physician-scientists to provide a bridge between the research bench and patient bedside; and physicians to be leaders in health care policy, quality and safety, and in medical education. Trainees should be allowed to differentiate and should be encouraged to pursue these and other career paths. GME programs should also be able to define the career paths for which they prepare their graduates and document their success in achieving their explicit individual goals.

Requirements for Implementation

This recommendation will require revision of certification requirements to provide greater flexibility so that individual trainees' learning plans can better reflect their career goals. (For example, requirements could maximize flexibility in the use of elective time and allow for part-time training extended over a longer period.) Likewise, accreditation requirements will need to provide flexibility in terms of the process of *how* programs are conducted by increasing and accelerating the emphasis toward outcomes, so that each program's design can reflect its distinctive goals.

Conclusion VI » Health professions education requires a robust body of knowledge— beyond what is currently available—to optimize quality and outcomes.

Recommendation VI » To best leverage the large public investment in medical education for the greatest good to society, a "National Institute of Health Professions Education" should be established and charged with coordinating, prioritizing, and funding research on health professions education, with a substantial focus on GME.

Rationale

Relatively little research is available to guide the education of physicians or other health professionals. This is remarkable given the magnitude of public investment in this education. A centralized mechanism for funding research and coordinating efforts across multiple sites and health professions according to established priorities will result in more productive and cost-effective research and, ultimately, in better trained health professionals and more effective care of patients and populations.

Requirements for Implementation

- Private-public partnerships should be developed to identify funding.
- A national database should be created to track physicians from medical school graduation throughout their careers with respect to their performance, location and type of practice, maintenance of certification, and disciplinary or legal actions. This database could be used to study the outcomes of GME (e.g., various training programs and curricula) as well as GME's impact on workforce needs and distribution.
- Regulatory bodies (including ACGME, ABMS, AOA and its specialty colleges, the Joint Commission, and CMS) need to allow justifiable exemptions from current rules—such as those involving duration of specific educational experiences, duty hours, supervision or billing requirements—for approved research studies.

Additional Notes

- International examples of innovations in health professions education should be compared with those from the United States and considered for possible study and adoption.
- Research into the relationship between the educational attributes of programs and future clinical outcomes of residency graduates should be used to evaluate GME quality and impact.
- Research into the relationship between institutional quality of care and the quality of resident education should be conducted to identify associations that can be used for institutional accreditation.
- Research is needed to develop tools and methods for assessing physician competence to determine when an individual is ready for independent practice and to ensure continued competency throughout each physician's career.
- Other areas in need of research include the following:

- Indicators of program quality
- Tools and methods to assess overall clinical competence
- Optimal length of training
- The volume and variety of clinical (or simulated clinical) experiences required, on average, to achieve competency
- Optimal educational team composition and relationships between supervisors and residents
- Part-time GME options
- "Re-entry" residency programs and positions
- Optimal methods for faculty development and tools for faculty evaluation.

ESSENTIAL ELEMENTS OF EFFECTIVE REFORM

Faculty Development

Discussing how to prepare, motivate, evaluate, and reward teaching faculty was beyond the scope of this conference, but the critical need to address these challenges was emphasized. The availability of dedicated and effective faculty is an essential element of GME and must be a key focus of efforts to reform and improve GME.

Faculty development is critical for effective cultural change in GME in areas related to core competencies, competency-based assessment, simulation and instructional technologies, the hidden curriculum, and barriers to teaching. Teaching faculty must better understand the competency framework and its goals, and must develop skills in assessing and providing effective formative feedback to trainees. Along with program directors, faculty must be able to identify resident performance problems and address these with effective remediation.

Faculty must be able to provide clinical supervision that ensures patient safety and high-quality care while supporting residents as they progress toward independent practice—often a difficult balance to strike. They must be able to coach and support residents, in addition to fulfilling the traditional "teacher" role.

In addition, all programs need at least some faculty who are skilled in using educational technologies, such as simulation, to ensure that trainees master skills where experiential learning is limited by patient safety concerns, time constraints, or financial issues.

Finally, GME faculty must be held accountable for their role, responsibilities, and performance as educators, and appropriately rewarded for the important work they do.

Regulation of GME

Accreditation and certification processes must be tuned to foster innovation in GME and promote diffusion of best practices across specialties and among training programs and institutions. Effective implementation of our recommendations will require that accreditation and certification entities rapidly adopt outcomes-based standards and evaluation measures, and diminish time-consuming process measures, as some are already planning to do. This will make it possible to more rapidly design, approve, and pilot well-designed, hypothesis-driven educational innovations, and to more broadly implement those innovations that are most successful. At the same time, the heavy administrative burden that too often distracts GME program directors and faculty from the more educational aspects of their roles, and requires fiscal resources that might be redirected to more fundamental educational needs, must be reduced.

Also, the regulation and oversight of GME that now extends only to accredited programs should apply to non-accredited programs as well. All GME programs—in order to be considered as such—should meet explicit educational standards.

Financing

Finally, ensuring that GME meets the needs of the public will require re-evaluation and revision of the present physician payment and GME reimbursement systems, which exert a dominant influence on specialty choices, the types and locations of institutions participating in GME, and the number and specialty mix of GME positions.

SUMMARY

GME reform is imperative if we are to have a more robust, reliable, and efficient health care delivery system. These recommendations provide a blueprint for achieving greater quality and efficiency in the GME system through closer partnership between the public and the profession, rigorous and transparent

assessment, and proactive planning. Expanding the sites and content of GME, learning across specialties and professions, and opportunities for tailoring programs and individual curricula toward specific career goals will better align GME outcomes with societal needs. Competency-based (rather than time-based) transitions into and out of GME will improve the efficiency of GME and ensure that future practitioners are better prepared to deliver high-quality care.

Several of these changes will require national planning and regulatory changes; others will have to be designed and implemented by institutions sponsoring GME. Thus, reform efforts will need to be well coordinated and broad-based. More research focused on health professions education will be required to ensure that the process of GME is continually improved to optimize the outcomes.

It is critical that all GME stakeholders recognize both the urgency and the opportunity of reform. Failing to accomplish necessary change will leave an enlarging gap between society's needs and what the graduates of our GME system can provide. We have the tools, talent, and commitment to accomplish reform of the GME system and must seize this moment to ensure that current and future patients get the care they need and deserve.

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COMMISSIONED PAPERS

THE HISTORY OF CALLS FOR REFORM IN GRADUATE MEDICAL EDUCATION AND WHY WE ARE STILL WAITING FOR THE RIGHT KIND OF CHANGE

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THEORY AND PRACTICE IN THE DESIGN AND CONDUCT OF GRADUATE MEDICAL EDUCATION

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THE HISTORY OF CALLS FOR REFORM IN GRADUATE MEDICAL EDUCATION

AND WHY WE ARE STILL WAITING FOR THE RIGHT KIND OF CHANGE

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Does graduate medical education (GME) in the United States need to be reformed? This may seem a surprising question about a residency system that remains the envy of the industrialized world more than a century after it was pioneered at the Johns Hopkins Hospital in 1889.[1] American physicians, as a group, are highly knowledgeable and skilled, and they have demonstrated the ability to acquire new knowledge and master new techniques throughout their professional lifetimes. At a 1992 Josiah Macy Jr. Foundation conference on GME, Alexander Walt, president of the American Board of Medical Specialties, defended the consistently "excellent" quality of the graduates of residency programs from this country.[2]

Nevertheless, almost from its very beginning, GME in the United States has been the subject of controversy and criticism. At the 1992 Macy Foundation conference on GME, Samuel O. Thier, then president of the Institute of Medicine (IOM), spoke of the issue of GME as "a hardy perennial."[2] By this he meant that the issue of GME "keeps coming back, it consistently interests people, and its problems never

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quite get solved."[3] A persistent concern throughout these many decades since the inception of the residency system of training has been whether GME is sufficiently addressing the health needs of the nation.

Table 1 Reports on Graduate Medical Education

Sponsor	Year of publication
Commission on Graduate Medical Education[3]	1940
Association of American Medical Colleges[4]	1965
American Medical Association[5]	1966
Josiah Macy Jr. Foundation[6]	1980
Association of American Medical Colleges[7]	1981
Josiah Macy Jr. Foundation[2]	1993
Institute of Medicine[8]	2003
Blue Ridge Academic Health Group[9]	2003
RAND Health[10]	2009
Medicare Payment Advisory Commission[11]	2009
Carnegie Foundation for the Advancement of Teaching[12]	2010

These criticisms of GME have been formalized in a series of official reports dating back to 1940 (Table 1). Here, I provide an analysis of these reports in the hope of achieving a better understanding of GME and the challenges to improving it. For the sake of simplicity, I have confined the discussion to official reports in which GME was the sole focus or a major focus of investigation. Not included in this analysis are editorials, sounding board pieces, or commentaries by individual authors writing in an unofficial capacity.

MEETING THE HEALTH NEEDS OF SOCIETY

A persistent theme through all the official reports on GME is the charge that GME is failing to sufficiently address the health needs of the nation. Typically, the reports express respect for the high quality of American physicians and the lofty professional standards of the training programs that produce them and the specialty boards that certify them. However, despite this admiration for the technical abilities of individual physicians, the reports assert that the system of GME as a whole is somehow dysfunctional, focusing on the needs of individual practitioners without considering the larger needs of the health care system or society.*

What requirements of the broader health care system have been perceived as unmet by GME? The different reports answer this question in different ways. In the 1930s, the residency system was still struggling to establish itself, as it faced fierce competition from other recognized pathways to specialization. Training in Europe, working in a specialty outpatient clinic at a teaching hospital, serving as an assistant to an established specialist, attending a short graduate course at a proprietary postgraduate school, and obtaining a PhD from a medical school in a clinical field were among the established routes to specialty practice available at the time.[1] Thus, the Rappleye report, the informal name for the report from the 1940 Commission on Graduate Medical Education,[3] is devoted to rationalizing the system of GME in the United States. This report defines and describes residency to the American public, distinguishes residency from internship and continuing medical education, and argues that residency should become the sole recognized path to specialty practice in the United States. As stated in this report, "When a residency is set up with proper educational standards, it is the most effective, economical, and satisfactory method for obtaining this training."[3]

By the 1960s, the residency system had long established itself as the sole route to specialization in the United States, and the country's system of GME had become the gold standard for the world. However, new concerns about GME emerged. Many worried that GME was too fragmented, that it should be explicitly recognized as part of a lifelong continuum of medical education. There were also frequently voiced concerns that GME, supposedly a field of graduate study, was too much influenced

*As one might surmise, the reports typically speak of GME in a broad, sweeping, overarching fashion, as if all programs and all doctors are the same. However, occasionally some granularity can be found. For instance, the American Medical Association's Millis report departs from the convention of praising the strength of American residency programs by describing the "undesirably large spread" that exists between the best and worst of the approved programs (American Medical Association, Citizens Commission on Graduate Medical Education. The Graduate Education of Physicians. Chicago, Ill: American Medical Association; 1966.). In the 1993 Macy Foundation report, Ebert and Ginzberg are less charitable than others in their assessment of American physicians. Although they consider American doctors to be "among the most technically competent specialists in the world," they state that American physicians do not rank as high "in other attributes thought to be desirable, such as compassion, understanding of human behavior, concern for the public's health, and an understanding of the limits of medical technology." They also describe the physicians "as more interested in procedures than in people; little concerned with the poor; and preoccupied with improving their own purchasing power." (Morris TQ, Coimbra MS, eds. Taking Charge of Graduate Medical Education: To Meet the Nation's Needs in the 21st Century. New York, NY: Josiah Macy Jr. Foundation; 1993.).

by the hospital rather than by the university. Many felt that residency programs within a hospital operated too independently from one another, oblivious to the concerns and needs of each other or of how they could work in conjunction with one another. These issues are confronted squarely by the Coggeshall report,[4] produced by the Association of American Medical Colleges (AAMC), and the Millis report,[5] from the American Medical Association (AMA). Both reports argue strongly that medical education should be viewed as a continuum, that the university should exert a more active voice in GME, and that hospitals should assume greater institutional responsibility for the operations of their various residency programs.

A decade later, new challenges in American health care had become apparent. Foremost among these was the perceived maldistribution of physicians by specialty type and geography. Health policy experts regularly bemoaned the preponderance of specialist physicians, the relative scarcity of primary care physicians, and the strong tendency of doctors to aggregate in affluent large communities but not in rural areas or inner cities. Reports from the Macy Foundation in 1980[6] and 1993[2] and from the AAMC in 19817 address these issues, criticizing GME for making no "serious attempt to relate the number and types of graduate medical education programs to national needs."[6] These maldistribution problems might be corrected, the reports argue, if GME programs were to take their responsibility to the public good more seriously. As expressed in the 1980 Macy report,

> To a certain degree, policies directed at the graduate medical education process may be used to alter both the specialty and geographic distribution of physicians by influencing the recent graduate's choice of specialty and location.[6]

By the 1980s, soaring health care costs had become a major area of concern in the American health care system. The 1980 and 1993 Macy reports and the 1981 AAMC report take aim at this problem as well. All three reports chide GME for not doing its part to keep costs under reasonable control.[2,6,7] Physicians, these reports point out, generated 75% of the costs of the health care system, and numerous studies had documented the tendency of physicians to overuse both diagnostic and therapeutic technologies.[2] Accordingly, residency programs needed to do a much better job in teaching the wise and cost-effective use of resources. As the AAMC report recommends,

> Teaching hospitals should increase their emphasis on research related to the effective use of resources and educating residents to utilize diagnostic and therapeutic procedures with due consideration of their contributions to optimal patient care and their costs.[7]

In the 21st century, the problem of health care costs has only grown worse, and reports on GME in recent years[8-12] also take GME to task for not preparing residents to serve as better stewards of the nation's health care resources. These recent reports contain more pleas to residency programs to teach residents about the costs of what they do, to promote wise clinical decision making, and to advocate better use of published evidence in devising clinical strategies. The cost issue is not new, but the severity of the problem has grown, and some of these reports adopt a strident tone in challenging GME to better address the problem of rapidly rising costs.

However, the 21st century also brought with it striking new dilemmas in the health care system. Among these are the problem of medical errors, the need to improve safety and quality, the challenge of integrating the electronic medical record and other new information technologies into medical practice, the rising importance of chronic disease, the declining importance of the hospital as the locus of acute medical care, and the need to provide better coordination of care. Once again, official reports criticize GME because its formal curricula, in the words of the Medicare Payment Advisory Commission's (MedPAC's) 2009 report to Congress, "are not well aligned with objectives of delivery system reform."[11] Recommendations from recent reports include more and better training of residents in ambulatory care, systems-based thinking, quality and safety improvement, multidisciplinary teamwork, and information technology.

These reports reveal why GME has perpetually been vulnerable to the criticism that it poorly prepares residents to serve the emerging health care needs of society: These perceived needs are always changing. Over the past century, the scientific basis of medical thought, the technologic basis of medical practice, and the demographics of disease have profoundly changed, as have American society and the health care delivery system. The result is continually changing professional demands on GME, for what worked yesterday might not work today or tomorrow. Of necessity, GME is in the position of having to play catch-up; the capacity of medical knowledge and the changing demands of the American people are always a step (or two or three) ahead of current GME practices. Some might applaud GME for

its adaptability and capacity to address the new problems that inevitably appear in health care delivery. Others might criticize GME for being too slow and awkward, or even insensitive in its efforts to respond. But the fact remains that GME is always chasing a moving target.

EDUCATION VERSUS SERVICE

Although the health care needs of the nation continually change, as do the challenges confronting GME, one fundamental problem of GME has proven consistently intractable: the tension between education and service. This is the most ancient dilemma in GME, having plagued the 19th-century system of "house pupil" appointments, a predecessor of contemporary GME. With the development of the modern internship and residency in the late 19th and early 20th centuries, this tension grew. During this time, the economic exploitation of "house officers" became tradition, as hospitals from the start insisted that trainees perform an extraordinary range and amount of ancillary responsibilities. It was frequently unclear whether GME represented education or service, or whether house officers were students or hospital employees.[1]

House officers began their GME knowing they would be working extremely hard. The fundamental pedagogic principle of internship and residency called for house officers to develop independence by assuming responsibility for their patients' total care. This made hard work inevitable and caused great difficulty in separating the educational from the service component of GME. If a house officer's patient spiked a fever at night, for example, that same house officer would draw the blood specimens and carry them to the laboratory him- or herself, if necessary. However, hospitals and medical faculties typically required house officers to perform far more service than that which was required for learning. House officers, for instance, were usually expected to draw blood samples not only on their patients or in emergencies but also on all patients on a service, day or night, and, frequently, to transport routine specimens from any patient to the clinical laboratory as well.[1,13]

Traditionally, the greatest exploitation of house officers as a source of inexpensive labor occurred at community hospitals not affiliated with medical schools. Before World War II, at many of these hospitals, interns were considered subordinate to nurses and were permitted only to take routine medical histories and administer intravenous medications. Didactic rounds, teaching conferences, and other educational activities were few. However, even in the strongest programs, the

amount of routine work could be overwhelming. At the leading teaching hospitals, house officers were deluged with innumerable duties—performing blood counts and urinalyses, transporting patients, drawing blood samples, and starting intravenous lines—for which a physician was hardly required. Complaints of too little teaching and too much "scut work" were commonplace.[1,13]

Since the mid-1980s, the nature of "scut work" has changed. Because most hospitals have introduced more extensive support services, residents are left with fewer blood samples to draw, fewer intravenous lines to start, and fewer patients and laboratory specimens to transport. However, more burdensome administrative chores have emerged to replace these tasks: scheduling tests and procedures, obtaining consultations, planning for discharges, and meeting the ever-increasing number of documentation requirements. More significant, the patient load of residents has increased dramatically during this time. A generation ago, an individual on a typical internal medicine resident service might receive 3 or 4 new patients each admitting day, and the average length of hospital stay was 10 or 11 days. After prospective payment for hospitals was introduced in 1984, the same resident might work up 8, 10, or 12 new patients in the same period, and the average length of hospital stay dropped to around 3 days. For residents in all fields, this change in hospitalization patterns resulted in busier days and nights, less time to read and sleep, and greater stress, tension, and fatigue.[1,13]

Indeed, in this era of "throughput," a profound burden for keeping the nation's teaching hospitals financially solvent has once again been placed on the backs of the resident staff. Traditionally, hospitals benefited financially from house officers by virtue of the routine work these individuals performed. The presence of house officers allowed hospitals to hire fewer secretaries, nurses, blood drawers, transporters, and other support personnel. In the era of high throughput, hospitals have continued to benefit financially from their resident staff because each new admission represents a fresh payment to the hospital. Without a resident staff caring for so many patients and, more important, turning over the service so quickly, hospitals would rapidly find themselves in dire financial straits. Of course, in such a frenetic environment, the quality of patient care and education can easily suffer because the only way a physician can turn over so many patients so quickly is by cutting corners and devoting less time to educational activities. Once again, service trumps education.[1,13]

The economic exploitation of trainees has been recognized from the very beginning of GME in the United States, and most official reports on GME address this problem. For instance, the Rappleye report criticizes GME for de-emphasizing education for service. According to this report, to improve the educational value of GME, first and foremost hospitals "must work out plans to relieve the intern [and resident] from many routine procedures which he is now performing but which have relatively little educational value."[3] After the noneducational responsibilities are removed, the next step to improving GME is "by expanding its educational content."[3] The report argues that hospitals should hire salaried physicians rather than interns and residents if they cannot make adequate educational opportunities available for trainees.

Despite these pleadings, the subjugation of education to service continued, and this led to many additional calls for residency programs to take their educational responsibilities seriously. Of the reports considered in this article, the Millis report,[5] the AAMC report,[7] and the 1993 Macy report[2] contain especially strong words to this effect. However, criticism of GME for exploiting residents and interns has not been confined to official reports. For instance, in the 1970s, the economic exploitation of house officers was a major factor in promoting the housestaff union movement.[13] More recently, Jordan Cohen,[14] in his term as president of the AAMC, repeatedly challenged teaching centers to make GME a genuine educational experience, and he famously spoke of the importance of "honoring the E in GME."

Why should there have been so much resistance to lessening the service load in GME? Ongoing research has revealed that every component of the house of medicine in some way gains from the perpetuation of the current system.[1] Medical faculties have long profited from the system because the presence of a talented resident staff has allowed them more time for their own research or, in more recent years, to see more private patients, thereby increasing their "clinical productivity" and enhancing their income. Private practitioners have similarly benefited from residents overseeing their hospitalized patients. Such an arrangement has made these physicians' lives richer and easier, allowing more time in the office or far fewer trips to the hospital from home on evenings and weekends. Hospitals, as noted, have long benefited financially from having a resident staff. In today's environment of admission maximization and high throughput, the reduction of residents' clinical workloads to more reasonable levels would be extremely costly for hospitals, which otherwise would have to hire additional physicians or midlevel practitioners to see the patients currently admitted and cared for by the residents.

In short, shifting the balance in GME away from service and more toward education has proven exceedingly difficult because the medical profession has become complicit in the status quo. Official proclamations about GME have always emphasized the importance of the educational experience, but these ideals have not been realized. Virtually every significant step that might be imagined to make GME a better learning experience would cost someone something in time, money, or both. Both hospitals and physicians benefit economically from the status quo, and medical faculty members benefit even more from the additional time they have for their own work when house officers are carrying the service load.

The tension between education and service underscores the financial dimension of GME. Since World War II, the number of residents in U.S. hospitals has increased exponentially, and residents, once accepting of room, board, and pocket change, now expect and receive respectable salaries somewhere near or slightly above the median for working Americans in their geographic region. GME has grown from a cottage industry to a multi-billion-dollar enterprise, supported mainly by direct and indirect educational payments from Medicare and, to a smaller degree, by private insurers, state and local governments, the Veterans Administration, and other sources. Further steps to improve GME—reducing the clinical workload of residents, providing more support with nonprofessional chores, providing for additional teachers and educational facilities, introducing new educational technologies, and developing curricula to teach new subjects—would only add further to the already considerable financial cost of GME. Thus, the questions of who should pay for GME, how much they should pay, and how residency programs should demonstrate their accountability for the large sums of money received become critical to resolving the long-standing tension between education and service. Only with sufficient funding can GME genuinely be improved and not be subjected to a continuous litany of criticism.

WHOSE PERSPECTIVE?

GME is far from monolithic, though it is frequently discussed as if it were. Programs greatly differ from one another in terms of quality, degree of academic orientation, size, location, patient population, and culture and traditions. The characteristics and requirements of residency programs also vary substantially from specialty to specialty.

Similarly, critics of GME are far from a monolithic group. Individuals and organizations bring their own orientation, perspectives, and biases to the conversation. This can lead to strikingly different assessments of GME or of what parts of GME are most in need of reform. These differing viewpoints can also lead to vigorous disagreement over what needs to be done to "fix" GME. These characteristics of the debate become evident in reviewing the earlier calls for reform.

Consider, for instance, the Coggeshall[4] and Millis[5] reports. Each is frequently likened to the other. Both were published around the same time, both argue that GME needs to be viewed as part of an educational continuum, both urge universities to exert a stronger voice in the conduct of GME, and both advocate that academic medical centers take stronger corporate responsibility for GME. However, they disagree on a major issue: which national organization should control and speak for GME. The Coggeshall report, sponsored by AAMC, argues that the AAMC should assume the leadership role for GME, and for all of medical education. The Millis report, sponsored by the AMA, argues that this leadership role belonged to the AMA's Council on Medical Education. Clearly, each report reflects the particular view of its sponsor.

This tendency for reports on GME to bear the perspective of their sponsor or organizer has been especially apparent during the past decade. Consider the IOM's report, *Health Professions Education: A Bridge to Quality*,[8] published in 2003. Three years earlier, the IOM had published its most influential report ever, *To Err Is Human*,[15] which exposed the problem of medical error and helped launch the safety movement as a public crusade. In *Health Professions Education*, the IOM echoes its earlier concerns, taking medical education to task for not satisfactorily teaching safety and quality. The solution, according to this report, is to incorporate into graduate (and undergraduate) medical education five core competencies so that all physicians, regardless of specialty, would be able to provide patient-centered care, work in interdisciplinary teams, employ evidence-based practice, apply quality improvement, and use informatics. Of note, this report does not address the internal learning environment of GME, the subjugation of education to service in residency training, or the problems of financing and regulating GME.

In its 2009 report to Congress, MedPAC, like the IOM, also criticized GME for not satisfactorily producing physicians who were able to meet the needs of the 21st-century health care system. However, echoing the concerns of its sponsor, Medicare, the MedPAC report focuses on the issue of cost containment. The great problem

of GME, MedPAC argued, was the failure to teach sufficient "cost awareness in clinical decision making."[11] What was needed in GME was better teaching of cost-effectiveness, as well as multidisciplinary teamwork, information technology, and caring for patients in ambulatory settings—all devices, if properly employed, of proven effectiveness in reducing unnecessary health care costs. Like the IOM report, the MedPAC report does not discuss issues pertaining to financing or regulating GME or ways to improve the internal learning environment.

In contrast, the report of the Blue Ridge Academic Health Group, an organization of administrative leaders of academic medical centers, takes a much more detailed look at the internal workings of GME.[9] As is the case in the other reports, the Blue Ridge Academic Health Group's report touches on many issues, expressing agreement, for instance, with the IOM's concern for improving the teaching of safety and quality improvement. However, the chief animus of this report is twofold: simplifying the complex regulatory structure of GME, and adopting strategies at academic medical centers to recruit, develop, and reward good clinical teachers. Such a focus was not unexpected from a group of prominent medical school deans and hospital presidents.

By far, the most extensive discussion of GME from the perspective of education appears in a 2010 report, *Educating Physicians: A Call for Reform of Medical School and Residency*,[12] sponsored by the Carnegie Foundation for the Advancement of Teaching (the most heralded private foundation in the field and also the sponsor a century ago for the landmark Flexner report[16]). Unlike all the other reports, the Carnegie report focuses on the internal educational environment of GME, bemoaning the deterioration of learning conditions that had arisen from our current preoccupation with maximizing throughput in American health care. In this environment, the authors write,

> Discharge becomes the highest goal. The imperative in the clinical environment is efficient patient management and swift disposition of problems; this task-focused environment is inhospitable to [intellectual] exploration.[16]

The authors describe a number of undesirable educational consequences of this environment, including less time for reading, fewer opportunities for reflection, a decline in the quality of teaching and supervision, and a shift in the character of GME from graduate education to vocational training.

Herein we see yet another reason for the failure of calls for the reform of GME to be heeded: the difficulty of taking a comprehensive approach to the problem. All the views described above are cogent and important, but each addresses only a piece of the puzzle, reflecting the particular perspectives and concerns of the sponsoring group. GME is a vast, intricate, complex enterprise, with each component affected by every other. It is exceedingly difficult to fathom or comprehend the enterprise in its totality, much less to devise solutions to its fundamental problems or gather the political will to implement those solutions. It is far easier to express some specific criticisms or suggestions and then relegate a report to a dusty bookshelf, assuming (or hoping) that this gargantuan enterprise, involving learners and teachers of intelligence, dedication, and good will, will somehow keep lumbering along.

THE LIMITS OF EDUCATION

The power of GME to provide physicians with the knowledge, attitudes, and techniques to practice medicine in a skillful fashion is beyond dispute. But what of choices physicians make regarding broader professional matters, such as what field to enter or where to practice? Choices like these pertain directly to the national good, as the widespread consensus since the 1960s has been that the country needs more primary care physicians and more doctors in inner cities and underpopulated rural areas.

A common criticism of GME, echoed in many of the calls for reform, is that GME has failed to serve the needs of the public because it has produced too many specialists and too few physicians willing to practice outside urban metropolises. If only medical faculties would do a better job encouraging these pursuits, so the argument goes, more graduates would enter primary care specialties and forsake big cities or comfortable suburbs. For instance, in an article entitled "Graduate medical education: Proposals for the Eighties,"[7] the AAMC argued against an allotment system for residency positions based on "mounting evidence that medical students modify their career choices when there is a general agreement that a change in specialty distribution is needed."

The empirical observation, however, is that the exhortations from medical educators have had little effect on many of the choices medical students and residents make. Primary care has long been at a disadvantage in relation to specialty medicine, not

only because of income differentials (an increasingly important factor as student educational debts soar) but also because of the perceived greater professional satisfaction of specialty practice and, in many specialties, the perception of an easier lifestyle. Similarly, many studies have shown that a resident's choice of a practice site reflects his or her response to professional, social, and financial incentives and that, in these regards, cities offer greater advantages than rural areas—as they do for most other Americans.[1] Thier spoke to this point in the 1993 Macy report:

> The problem is not with graduate medical education. Rather, the problem lies in the way the nation reimburses for health care services and in the way the entire health care system is organized.[2]

GME, important as it is, according to Thier, "cannot transform the health care system."[2]

These debates about residents' choices mirror a broader debate in American education over the capacity of education to influence behavior. The traditional orthodoxy of the American educational system has been the belief that education can shape behavior and mold character.[17] Yet, many factors beyond formal education have also been seen to influence behavior. In his book on the history of American education, published in 1988, Lawrence A. Cremin[18] pointed out that there have always been limits to formal education as a behavioral force. Behavior, he maintained, is shaped by innumerable "educative" influences—one of which is formal education, but which also include the totality of an individual's upbringing and environment, encompassing such factors as family, friends, neighborhood, religion, and popular culture.

Here, then, is still another reason the earlier calls for reform have failed to induce their desired effect: unrealistic expectations over what GME can and cannot do. The importance of GME in producing proficient physicians is indisputable, as is its capacity to influence doctors' values, attitudes, and behaviors. But, for many of the issues brought up in previous calls for reform, the lesion is misidentified. That is, the problem under discussion lies with the health care delivery system, not with GME as such. The health care system is the independent variable, and GME is the dependent variable. The only way to prevent disappointment and disillusionment with GME is to recognize that one or another educational "fix" inevitably does not cure the diseased health care delivery system.

MAKING GME BETTER

In some respects, it is not surprising that earlier calls for the reform of GME have had little effect. A report has moral authority only. It has no real power of its own. The committee typically disbands after the report is published, and no one—neither committee members nor sponsoring organizations—has control of the potent levers of accreditation or financing, which conceivably could be used to promote change in a particular direction. In the history of medical education, the only report that had a transforming effect was the Flexner report, and that report had the great advantage of appearing at a time when public sentiment demanded that medical education be reformed.[19]

These observations do not decry the potential accomplishments that can follow from a thoughtful, cogent report. An effective report can identify key issues and problems, make forceful recommendations, and serve as a strong moral compass. In the case of GME, it might be easier for a report to have a positive effect, as this article has suggested, if it fully recognizes the complexity of GME, adopts a comprehensive approach in its analysis and recommendations, and acknowledges what GME is and is not capable of doing in terms of serving the broader needs of the health care system.

At the present moment, undoubtedly the most significant requirement for GME to thrive is adequate financial support. Little was said of this subject in earlier calls for reform, but adequate funding is clearly the underpinning of a successful system of GME. Large amounts of money are required not only to provide house officers with salaries and benefits but also to develop every aspect of the learning environment that is necessary for the production of competent, caring, and socially responsible doctors. The financial needs of GME include money for teachers, support staff (to lessen the burden of nonprofessional chores), other medical professionals (to care for some of the patients currently managed by residents), curricula development, and new educational technologies.

Ultimately, the quality of GME will depend on the quality of health care delivery in the United States. The external forces are more powerful than the internal. The GME enterprise depends on society not only for financial but also for moral support. Residents learn their fields in the real world where patient care is actually delivered. If the health care environment continues to worship volume instead of quality of care, the ultimate products of GME are likely to be disappointing. Conversely, if the

future environment of patient care recaptures a more genuine concern for caring and service, the products of GME would be much more likely to emerge as we might hope. Thier got it right in the Macy report two decades ago when he stated that, in the final analysis, the fate of GME depends on the fact of health care delivery.[2]

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EXIT

THEORY AND PRACTICE IN THE DESIGN AND CONDUCT OF GRADUATE MEDICAL EDUCATION

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Theories provide complex and comprehensive conceptual understandings of things that cannot be pinned down: how societies work, how organizations operate, why people interact in certain ways.

—Reeves et al[1]

Medical education practice is more often the result of tradition, ritual, culture, and history than of any easily expressed theoretical or conceptual framework. In this article, we explain the importance and nature of the role of theory in the design and conduct of graduate medical education, and we outline three groups of theories relevant to graduate medical education: bioscience theories, learning theories, and sociocultural theories.

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WHAT IS THEORY?

Theory is like gravity: profoundly linked to our experience of life, but also more conceptual than material and therefore not directly visible. Gravity has been present throughout human existence, but it was not until Newton described gravitational theory that humans had a conceptual language to discuss its nature and use. Gravity was, of course, used in practice long before it was formulated in theoretical terms. However, only with the advent of scientific theory could an in-depth understanding of gravity be harnessed for research and development.

Theories of many kinds play a role in medical education and practice. Yet, as with gravity prior to Newton, practice in medical education is more often the result of tradition, ritual, culture, and history than of any easily articulated theoretical or conceptual framework. Practices are reproduced and passed down without being anchored to theories that explain why certain approaches lead to effective education. The rise of formal studies in medical education, with burgeoning research, journals, and international conferences, raises new questions about the relationship between theory and practice in this field.

In medical education, as in other scientific fields, there is the promise of improving practice by basing it on theory and evidence. Bordage[2] has argued that all research and development in medical education should be based on a theoretical framework. However, there is a risk of developing an artificial split between theory and practice—relegating the former to ivory tower theoreticians and the latter to in-the-trenches practitioners. Albert and colleagues[3] argue that knowledge generation based on theory can serve both researchers and practitioners but that the nature and control of knowledge generation, its funding, and the format and dissemination of the resulting knowledge differ depending on the intended audience. Stokes,[4] in *Pasteur's Quadrant*, suggests that research should emphasize both the development of theory and the use of new knowledge to improve practice. Pasteur's own research simultaneously led to the development of germ theory and to the means to pasteurize milk. It is in this spirit that we wrote our article: to explore the relationship between theory and practice in a way that advances both theoretical understanding and the effectiveness of practice for an audience of educators (including clinical teachers, administrators, and researchers) interested in graduate medical education. To accomplish this aim, medical educators must pay greater attention to their theory literacy so that they can articulate continuously the link between theory and practice.

Many terms could be used to frame this discussion; in the first few paragraphs above, we have employed several of them. Terms such as theory, conceptual framework, epistemology, and paradigm have different but related meanings, as do the words practice and praxis. However, we have left aside discussion of these terms' nuanced meanings and deliberately lumped them together to improve accessibility for the nonspecialist reader. We have used theory to represent what Reeves and colleagues[1] have called a "complex and comprehensive conceptual understanding" of how things work. Similarly, we use have used practice to represent doing—teaching, learning, creating, interacting, leading, governing, and all the other activities that collectively make up education. The interested reader can find a more detailed glossary of these terms in one of our previous publications.[5]

WHAT KINDS OF THEORIES ARE USEFUL TO GRADUATE MEDICAL EDUCATION?

> Far from being ivory tower concepts debated by armchair theorists at great remove from "real" clinical and educational settings … theories are very useful ways to analyse the nature of medical schools and the roles people play within them, in the service of imagining and enacting anything from a minor change to a radical reform.
>
> —Kuper and Hodges[6]

There are hundreds of theories. They range from local to global, from small scale to large. There are grand theories and circumscribed theories, theories tied to disciplines (economics, sociology, biology, physics), to approaches (critical theory), and to schools or movements (psychoanalysis, Marxism). There are popular theories, discredited theories, overapplied theories and little-known theories. In preparation for this article, we reviewed the literature on theories of medical education. Searching appropriate databases with the terms theory and medical education yielded diverse abstracts illustrating the enormous breadth of the existing literature. Approaching theory in this way, however, would be daunting for a medical educator. Consequently, in this article we have presented a few broad groups of theories that are useful to discussions of graduate medical education.

For the purposes of this discussion, we have classified theories into three large groups: bioscience theories, learning theories, and sociocultural theories. Table 1 presents a list of theories, clustered by theory type, and provides comments

about their application to graduate medical education. In the bioscience cluster, theories arising directly from neuroscience, kinesiology, and even genetics have relevance for medical education because of their focus on how the human brain learns. At the other end of the spectrum, sociocultural theories from sociology, anthropology, economics, and other disciplines provide useful perspectives on why we have medical schools at all and how they function vis-à-vis the larger societies in which they operate. Our divisions between these clusters are not sharp; clustering theories at all is simply a shorthand way of helping readers understand differences in theories' history and nature. For example, although we have located cognitive psychology within the biosciences, it is commonly used as a foundation for many learning theories. Other areas of psychology, such as social psychology, draw on broad social perspectives and, thus, could be classified under sociocultural theory. Our groupings are simply a means of organizing a very large range of theories for the purpose of approaching a daunting body of literature, not a coherent conceptual framework of its own.

BIOSCIENCE THEORIES: POWERFUL, OFTEN TAKEN FOR GRANTED

Theories arising from bioscience are the most familiar to medical educators because medicine itself has long given priority to biomedical models of practice and research. Bioscience theories—theories arising in disciplines focused on the biological substrate of life (e.g., biochemistry, genetics, neuroscience)—are so familiar that it is easy to forget that they are theories, not truths. It is often only when one long-held understanding is displaced by another that the theoretical, and therefore tentative, nature of bioscience theories becomes visible. Famous examples of this include the shift in the accepted etiology of gastric ulcer disease from stress to bacteria, the rejection of the notion of parenting style causing schizophrenia in favor of the dopaminergic hypothesis, and the discredited aluminum theory of Alzheimer disease. A great majority of the developments in medicine that we believe to be true are actually based on theoretical assumptions and imperfect evidence that may be swept away by new research leading to more explanatory theories.

Because bioscience approaches are so dominant in medicine, they are not often articulated as theories per se. The pervasiveness of such "theories" can lead to the impression that no particular theory is being used. Thus, physicians and medical educators sometimes have difficulty identifying the nature of theory itself.[7] The social sciences have a stronger tradition of explicitly articulating what theory is, debating

which theories are relevant to which contexts and questions, and studying the history and evolution of theory itself. Social scientists therefore have more experience in thinking about the role and utility of different theories. If we in medical education follow this approach and think about the theoretical basis of bioscientific knowledge, we can gain a deeper understanding of the utility of theory for medical education.

BIOSCIENCE THEORIES AND MEDICAL EDUCATION

> … there have been numerous books, journal articles, policy studies, and stories in the media about how our emerging understanding of brain development and neural function could revolutionize educational practice.
>
> —Bruer[8]

Fundamental bioscience theories arising from domains such as biomolecular medicine and genetics may initially seem to offer little to medical education. However, it is striking how often the concept of genetic determinism is applied to discussions about medical school and residency admissions, wherein endless debates occur about attributes appropriate for medical education and practice. These arguments are sometimes based on notions of fixed, inherent, and presumably genetic human characteristics. A study by Garfinkel and colleagues,[9] for example, rooted in the presumed existence of biologically determined personality traits, looked at the relationship within a group of psychiatrists between their levels of sociopathy (as measured by the Minnesota Multiphasic Personality Inventory) and their later sexual abuse of patients. The authors found that, although certain traits may be associated with unprofessional behavior, the influence of context was so strong that trying to base decisions on predetermined traits risked unethical practices. Whereas links between personality and later behavior can be shown in many domains, and although genetic determinants of human behaviors undoubtedly exist, environmental contexts shape behaviors to such an extent that genetic contributions alone cannot be isolated. Thus, although biological, genetic, and other deterministic theories have relevance to complex behaviors, their tacit use in the admission process belies the importance of context; they are probably, for the moment, a bridge too far to be useful for medical education.

Neuroscience, by contrast, offers useful theoretical notions for education. A recent review of the neurobiology of learning provides glimpses of how neuroscience might influence medical education.[10] LeBlanc,[11] for example, looks at how

activation of the hypothalamic–pituitary axis during stress in simulated learning environments significantly affects everything from drug dose calculations to decision making and collaboration. Here, concepts from neurophysiological theory have propelled a program of research with implications for medical education ranging from the effectiveness of learning in a simulated environment to understanding how clinicians interpret a complex situation as either a threat or a challenge.[12] Similarly, emerging neuroscience theory about attention and memory formation has contributed important understanding of how students work with, represent, and retain information during learning. Recent research, for example, has cast doubt on multitasking—something almost ubiquitous in clinical settings—being adaptive in relation to memory formation.[13,14]

A third area in which bioscience theory has been applied to medical education arises from kinesiology. Research by Walsh and colleagues[15] and Brydges and colleagues,[16] for example, draws on theories of motor control to understand motor learning in technical skills. Theories from basic motor learning have been used to inform the design of regimens for acquiring technical skills. For example, Fitts and Posner's[17] model of automaticity and skill expertise has long dominated the literature of surgical education. Ericksson and colleagues'[18] notion of deliberate practice and expertise has served as the basis for the development of simulation programs and of competency-based curricula; more recently, Guadagnoli and Lee's[19] challenge-point framework has influenced thinking about model fidelity in simulated settings increasing in tandem with growing expertise.

Since the 1950s, many psychologists and psychometricians have joined the ranks of medical schools. From early on, these researchers engaged in significant advocacy to legitimize their expertise and their importance to medical education.[20] This may be one of the reasons that psychological theories have arguably had the most dominant presence of all bioscientific theories in medical education. For example, there is a long history of studying cognitive decision making, including how knowledge is structured for learning, recalled later, and employed in practice. Research programs such as those of Patel and colleagues,[21] Norman and colleagues,[22,23] Dolmans and Schmidt,[24] and many others build on cognitive psychological theories and have widely influenced the design of medical education and the choice of pedagogical approaches—one famous example being the published debate between Colliver[25] and Norman and Schmidt[26] about the theoretical basis (or lack thereof) for problem-based learning. Theories from cognitive psychology continue to offer important

foundations for the design of educational courses, programs, and tools. For example, Gruppen[27] summarized the implications of cognitive theory for ambulatory care education, underscoring the importance of context in learning, the need for students to have "transferable knowledge" to function in ambulatory settings, the importance of balancing depth and breadth of knowledge, and the role of prior knowledge in diagnostic decision making and problem solving.

The emergence of multimedia technologies has led to the growth of new theoretical research in a branch of cognitive psychology that studies conceptual models of learning. For example, the cognitive theory of multimedia learning posits that people learn differently from words than from pictures because there are separate channels for processing these two different kinds of inputs. Because the capacity to process information in working memory is limited, meaningful learning requires appropriate cognitive processing that includes both textual and visual images. Mayer[28] provides nine evidence-based approaches to guide the design of multimedia learning materials and resources in line with this theory. At a time when graduate medical education is enthusiastically embracing myriad Web-based approaches, including e-learning, social media, and handheld devices, it is particularly important to ensure that the use of these tools is grounded in theory and not simply driven by enthusiasm (or marketing pressure) for new technologies and gadgets. van Merriënboer et al,[29] as well as several other authors,[30,31] use cognitive load theory to understand how to design educational programs and materials, in particular those using multimedia and simulation. van Merriënboer et al developed guidelines for instructional design based on this theoretical model of human cognitive architecture that implies that learners cannot attend to too many sources of stimuli at one time and that the goal of education (particularly simulation training) is to automate some cognitive and motor processes to increase learners' available attention and, therefore, cognitive and motor ability.[29] Kurahashi et al[32] have applied the theory of cognitive load to problems in simulation-based training of technical and other skills.

Although debates about the effectiveness of various modes of learning are rarely couched in biological terms, the effectiveness of various kinds of media (including social media), classroom approaches, and testing methodologies can be approached through the lens of bioscience, building on theories about how the brain functions. While it is certain that many new technologies will be implemented in graduate medical education, Carnahan and colleagues[33] have underscored the importance

of asking theory-driven questions about the utility of new approaches and testing new educational models experimentally rather than simply trying out untested approaches in educational settings and then evaluating their use in practice.

LEARNING THEORIES: COMMON, USEFUL, VARIABLE EVIDENCE BASE

> Clinical effectiveness and efficiency in medicine for patient benefit should be grounded in the quality of medical education. In turn, the quality of medical education should be informed by contemporary learning theory that offers high explanatory, exploratory and predictive power.
>
> —Bleakley[34]

Learning theories are popular and useful for medical education generally and for graduate medical education specifically. Such theories emerge from a range of different disciplinary traditions, primarily psychology and education. Mann[35] has recently published a helpful overview of learning theories commonly applied to medical education. Her review focuses on learning theories in five categories: behaviorist, cognitivist, humanist, social, and constructivist. We recommend Mann's classification to those interested in this area.

Although learning theories are widely employed, their evidence bases are not equally robust. Some seem to operate more as metaphors about learning than as true theories. Norman[36] has sharply critiqued one of the most commonly cited learning theories: adult learning theory.

> Adult learning theory, first described by Malcolm Knowles in the early 1970s, is based on a number of apparently self-evident axioms about how adults learn. The fundamental assumptions remain largely untested, and a critical analysis suggests that they may be largely a product of the environment in which adults find themselves rather than of any innate differences between adults and children…. Uncritical reliance on the principles of adult learning may have detrimental consequences, particularly in the domain of maintenance of competence.

Eva and Regehr,[37] among others, compare several different theories in an effort to understand why self-assessment and self-direction—the central constructs at

the heart of adult learning theory—are problematic in many studies. Simply put, self-assessment and self-direction seem not to be evidence-based constructs. By contrast, notions such as self-monitoring[38] and directed, self-guided learning[39] rest on a stronger theoretical base and therefore have greater promise for the design and assessment of graduate medical education. The nature and function of the related notion of feedback, another ubiquitous but undertheorized construct in medical education, is also beginning to be explored. For example, theory-based research has shown robust differences related to the timing of the provision of feedback and its variable effects on learning.[40]

In her review, Mann[35] argues that too much attention has been focused on learners as individuals, noting that the most robust learning approaches are based on theories that view learning as "intimately tied to context and occurring through participation and active engagement in the activities of a community." She highlights social cognitive theory and situated learning theory as strong bases on which to design medical education. Within these theories, the notion of legitimate peripheral participation provides a way of understanding how learners move from the periphery of a practice community (as observers of professional activity) to more central participation and responsibility. These theoretical perspectives direct attention away from the assessment of decontextualized individual traits and toward analyzing learner behaviors and participation in practice settings. The emphasis is on collective learning, not only in groups or teams but also by whole institutions. Weaving together the outcomes of educational programs with those of health care institutions requires measures well beyond the assessment of knowledge on written tests or of skills on an objective structured clinical examination. Rather, the important indicators of learning at an institutional level are patient outcomes and other systems-level indicators. For graduate medical education, the implication is that teaching and assessing students based on lists of decontextualized skills and areas of knowledge are less important than focusing on residents' learning and the evolution of residents' competence in actual practice settings. For example, the work of Kennedy and colleagues[41] on progressive independence uses several different theories to explore this crucial but generally taken-for-granted aspect of learning in health care institutions.

Similarly, Kneebone[42] has marshaled learning theory to purposefully design simulation-based learning in technical domains. Kneebone argues, on the basis of theoretical research, that simulations should allow for sustained, deliberate practice in a safe environment, that recently acquired skills must be consolidated within a

defined curriculum that includes regular reinforcement, that simulations should include access to expert tutors, and that simulations should map onto real-life clinical experience. The implication is that simulation in graduate medical education should be neither an add-on nor an entirely self-directed activity but, rather, must be thoughtfully and systematically embedded in the design of both learning and practice. The lack of a theoretically informed approach to most simulation training may help to explain emerging findings of failure to learn in simulated environments.[43]

SOCIOCULTURAL THEORIES: UNDERUSED, COMPLEX, VALUABLE

> Social science theories can be used to explore how particular modes of medical education are constructed, examine unexplored assumptions about their nature and function, and make visible implications and adverse effects of the way they have come to be.
>
> —Kuper and Hodges[6]

Many medical educators today are making good use of learning theories to provide context for their research and to recommend educational program design. However, in another article reviewing the use of theory in continuing medical education, Mann[44] asks a challenging question: How much has educational theory helped us? She argues that the answer is mixed; in some instances, theory has indeed been helpful to inform educational practice. At the same time, a great deal of theoretical work has been difficult to apply or has proved to be of questionable validity (as with adult learning theory). She notes that "an emerging area of theory that may hold great opportunity for practitioners … comes from anthropology and sociology and the study of sociocultural learning."[44] Similarly, Bleakley[45] argues that a mismatch exists between the broad range of theories offered in the wider education literature and the relatively narrow range of theories that have been privileged in medical education. He suggests, like Mann, that currently dominant learning theories are limited in that they address how individuals learn, yet fail to explain how learning occurs in "dynamic, complex and unstable systems such as fluid clinical teams."[45] We agree with Mann's and Bleakley's assessments and suggest that it is important for postgraduate medicine to look to sociocultural theories, which by their nature are concerned with context and systems.

Sociocultural theories have been, until recently, largely unknown to medical educators. Researchers outside medicine have sometimes studied medical education using such theories, which produced, for example, classic medical sociology texts about acculturation in medical school by eminent sociologists like Becker and colleagues[46] (*Boys in White*) and Merton and colleagues[47] (*The Student–Physician*), who were not themselves engaged in medical education. Medical educators themselves, however, have rarely known enough about sociocultural theories to enable such theories' application to the development of medical education. This is now changing as sociologists, anthropologists, political economists, and others with expertise in the social sciences and humanities are entering the field of medical education research, bringing with them a wide variety of perspectives, approaches, and theories from their home disciplines.

At first glance, such theories and perspectives, which often address large-scale societal questions, may seem vague and distant from the practical concerns of clinical teachers. However, sociocultural theories can be intensely practical. They can provide lenses that selectively highlight different aspects of medical education, allowing each to be addressed in turn. For example, some theories call attention to structural issues, enabling a close examination of the positive and negative effects of legislative or policy contexts and constraints on medical education. Others hone in on social relations between and within groups, exposing to scrutiny the cultural, social, or interpersonal aspects of medical education. Many such theories are critical, which means that they highlight the effects of power, bringing attention to inequities that might otherwise go unnoticed. Sociocultural theories make certain previously invisible things visible; newly visible problems can then be studied, and newly visible solutions can be implemented.

Sociocultural theories can, in this way, eventually lead to a wholesale reimagining of medical education. In *Medical Education for the Future: Identity, Power, and Location*, for example, Bleakley and colleagues[48] use several critical theories to argue that medical education as a practice must be reoriented toward a patient-focused, democratic future. They contend that the staunchly individualistic hero–doctor is no longer the professional ideal; rather, the purpose of medical education is to develop medical professionals who can participate in dispersed social networks that form and reform to accomplish clearly defined health care tasks. They describe how modernist, sterile, and sequestered classrooms should be replaced by flexible, human-scale spaces embedded in the complex messiness of real-world health care.

Further, they suggest that the artificial separations of classroom and clinic and of simulated and real experiences should be dissolved.

The implications for graduate medical education are significant. Although new competency frameworks in the United States and Canada emphasize roles beyond medical expertise, Bleakley and colleagues'[48] analysis suggests that fostering such competencies as collaboration, communication, advocacy, and systems-based practice should be embedded in real workplaces and not sequestered in academic half-days and classroom learning environments. Furthermore, learning about these dimensions of competence makes visible such entities as social networks, team dynamics, and the changing role of doctors and other health professionals in society. Bleakley et al highlight the particular utility of such theories as actor network theory and cultural-historical activity theory and how these approaches can be used to reconceptualize the goals of medical education.

Sociocultural theory can also be used to ask very pragmatic questions about medical education. For example, feminist and antiracist theories, which make visible the inequities due to gender, religion, race, and/or sexual orientation, have a great deal to offer for understanding and addressing one of graduate medical education's biggest problems: the hidden curriculum.[49-51] Although a student can be prepared for excellent communication, collaboration, empathy, and patient-centered attitudes through years of formal training, just a few minutes in a work environment that does not model these behaviors will rapidly lead to their extinction in the student's behaviors. We may teach residents to respect other health professionals in a simplistic way, but if they are never exposed to thinking about the power disparities, hierarchy, and boundary struggles that exist between professions, they will have no way of interpreting, much less coping with or ameliorating, these dynamics in the workplace.[52] Thus, using sociocultural theories to decode toxic learning environments (something often unearthed during accreditation processes) can illuminate maladaptive practices and the hidden curriculum.

The perspectives of certain iconic sociocultural theorists also make it possible to untangle specific problems faced in graduate medical education. For example, Bourdieu's social capital theory could be used to better understand the differences and competitiveness of medical schools and residency programs in terms of attractiveness to applicants, reputation, and admission rates.[53] Neo-Marxist theories, which focus on capital and class structures, could be used to understand connections among remuneration, practice patterns, and—of great concern to postgraduate

education—career choice.[54] Foucault's theory of discourse and his notion of normalization bring to light (and thus allow to be addressed) the constraints on what it is possible for a student or teacher in educational and health care institutions to say, think, and be. For example, a Foucauldian perspective has been used to study how power operates in objective structured clinical examinations, where pseudoempathy can emerge,[55] and to grapple with the implications of using physicians as opposed to standardized patients as examiners.[56]

At the level of social relations, Bakhtin's[57] theories of language and his notion of utterance, and Smith's[58] theorizing of the intersubjective creation of meaning, offer approaches to understanding and teaching interpersonal communication, including communication within patient–physician and/or trainee–consultant dyads. These sociocultural theories can help us understand why training in interprofessional communication and team-based collaboration, for example, frequently fails. Although pragmatic communication skills or collaboration skills may be learned, if the forces of professional hierarchy, power differentials, and identity are ignored the skills may never be employed, or, worse, the very opposite of the intended pedagogy may be conveyed as a hidden curriculum.

PUTTING THEORY TO WORK IN GRADUATE MEDICAL EDUCATION

> Theory can help people move beyond individual insights gained from their professional lives to a situation where they can understand the wider significance and applicability of these phenomena. Good theory based research is immediate, insightful, and applicable in practice.
>
> —Reeves et al[1]

> There is nothing so practical as a good theory.
>
> —Lewin[59]

Theories enable educators to make visible existing problems and to ask new and important questions, both of which can inform everyday practice. In this light, the dichotomy between academic/theoretical knowledge and applied/practical work is artificial. Knowledge and practice are not separate. Indeed, practice is impossible without some kind of conceptual framework, and working with theory is

as much about becoming aware of the assumptions that animate our choices and behaviors as it is about a deliberate search for new theories to apply. It is said that in psychotherapy, patients treated by therapists with a theoretical understanding of their problem have better recovery rates. Interestingly, it may be less important which theoretical model the therapist holds than that she or he does hold one.[60] It seems probable that simply holding a theoretical framework is helpful for educators as well because having a theoretical framework allows for a reasoned choice of action that can be justified to oneself and discussed with others. Rees and Monrouxe[61] quote Leonardo da Vinci as saying, "He who loves practice without theory is like the sailor who boards ship without a rudder and compass and never knows where he may cast."

Just as medical educators encourage medical trainees to be reflective about their actions and the reasons for them, we encourage medical educators to be more reflective about the theories that guide their educational practices. A medical educator who feels strongly about a particular approach to learning and teaching (e.g., a pedagogical method, assessment framework, or model of student development) should think about what theoretical notions underlie his or her beliefs and behaviors, whether a particular theoretical framework could be used to better articulate those beliefs and behaviors, and to what degree others have examined the value of that particular theoretical perspective.

Sometimes, theoretical perspectives can be in tension.[62] However, the goal of medical educators should not be to choose one best theory above all others. Our belief is that medical educators should avoid paradigm wars and disciplinary sniping. Successful examples of theoretical harmony already exist in the literature of medical education. For example, a recent national consensus process led by one of us (B.D.H.) identified, classified, and illustrated a range of theoretical perspectives on the much-debated construct of professionalism. The goal was not to reduce the multitude of perspectives on professionalism to a simple consensus but, rather, to illustrate the plurality of ways in which the construct can be understood, taught, assessed, and researched.[63] Addressing professionalism at the individual level calls on theories related to personality or cognitive attributes. Social interactionist theories inform the structure of teaching and role modeling related to the interpersonal dimensions of professionalism. Finally, sociocultural theories can explain the political and economic drivers of institutional behavior and culture and how behaviors are shaped by hidden curricula. Kennedy and colleagues[41] used a similar approach to compare and contrast what theories from counseling psychology,

cognitive psychology, kinesiology, and sociology offer to improve our understanding of the phenomenon of progressive independence in clinical training.

Sociocultural theory is particularly applicable to graduate medical education because it is deeply embedded in workplace settings. In his book *Profession of Medicine*, Eliot Freidson[64] argued decades ago that physician behavior is far more influenced by the nature of the workplace than by anything doctors learn as students. Recent calls for medical education reform, including the Carnegie Foundation's post-Flexnerian *Educating Physicians: A Call for Reform of Medical School and Residency*,[65] the American Medical Association's *Initiative to Transform Medical Education: Recommendations for Change in the System of Medical Education*,[66] and the Association of Faculties of Medicine of Canada's project *The Future of Medical Education in Canada*[67] all demand greater attention to learning contexts, workplaces, and the roles of physicians in the societies to which they are accountable. Thus, while bioscience and learning theories will continue to be very important in medical education research and practice, underused sociocultural theories, with explanatory power at the level of the environments in which medicine is learned and practiced, may be particularly informative in responding to these calls for reform and redesign of postgraduate medical education.

To illustrate links between theory and practice, we created Table 2. There, we took three familiar graduate medical education objectives (learning technical/clinical skills; learning team collaboration; gaining progressive independence) and contrasted practices that are *aligned* or *not aligned* with the bioscience theories, learning theories, and sociocultural theories we presented in this article. For each, we have provided one or more references to publications cited in this article. These references were chosen not because they specifically address the practice elements included in the table but because they describe or use a theoretical perspective that would be consistent with engaging with or understanding each particular practice. Our goal in providing these elements is twofold: to illustrate the range of bioscience theories, learning theories, and sociocultural theories that can be brought to bear on practical problems, and to illustrate how authors have used theory to understand or evaluate similar, if not precisely the same, practices.

HOW DOES A MEDICAL EDUCATOR LEARN TO USE THEORIES?

> Medical education journals, once content to publish descriptions of innovative pedagogical methods or simple quantitative studies, are now turning to deeper theoretical questions including ontological and epistemological inquiries into the nature of health professional education.
>
> —Hodges[62]

Theories, by nature, are conceptual and explanatory and therefore built on layers and layers of scholarly work, research, writing, and debate. Theories are dynamic, evolving, and always at risk of being disproven. Engaging with theories, understanding their conceptual dimensions, and mastering the intellectual basis of their fundamental concepts are not easy tasks. Certainly, doctoral education requires engaging theories through in-depth study and is one way of learning to think, write, and work with theory. Medical education journals, conferences, and even day-to-day engagement with colleagues in medical education seem to demand an ever-increasing theory fluency. Graduate education is, of course, neither realistic nor necessary for all medical educators. Nevertheless, anyone setting out to master a theory-informed approach should understand that such mastery is going to take some work. Extensive reading is required. To use a theory in practice is to be able to articulate what one believes about education and the nature of the evidence that supports those contentions, as well as to recognize and embrace discussion and debate with others who hold different, but no less theoretically informed, points of view.

Bleakley and colleagues[48] have argued that, whereas early 20th-century structural reforms in medical education revolved around a scientific imperative, today's reorientation of medical education around sociocultural axes requires the development of a corps of medical educators and clinical teachers with a strong grasp of theory, sustained by well-developed pedagogical and research skills. The source materials that medical educators of the future will need to read, they argue, are not simply those that describe methods for teaching, assessment, or research but, rather, those that help medical educators to deepen and transform their thinking in conceptual ways. The need for faculty development to support this process is evident.

We created this short review of the nature and use of theory in postgraduate medical education to make the topic more accessible, to illustrate the links between theory and practice in medical education, and to provide resources for further reading (see List 1). Mastering one or more theories is not a simple task, and medical education has lacked guideposts to help educators and administrators. We hope that this article goes some distance in showing the way forward.

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List 1 Suggestions for Further Reading*

Bioscience Theories and Education
Bruer JT. Education and the brain: A bridge too far. Educ Res. 1996;26:4–16.

Learning Theories and Education
Mann KV. Theoretical perspectives in medical education: Past experience and future possibilities. Med Educ. 2011;45:60–68.

Sociocultural Theories and Education
Kuper A, Hodges BD. Medical education in its societal context. In: Dornan T, Mann K, Scherpbier A, Spencer J, eds. Medical Education: Theory and Practice. London, UK: Elsevier; 2010.

**These suggestions are not meant to be comprehensive but, rather, to point the interested reader toward short, accessible introductory works in three different areas of theory that are important for graduate medical education.*

Table 1 Examples of Different Types of Theories and Their Applications to Graduate Medical Education (GME)*

	Example of a Relevant Issue in GME	Hypothetical Example of a Specific Intervention in GME
Bioscience theories		
Personality/genetic theory	Characteristics for admissions to residency training	Predicting conduct/misconduct in future practice using personality traits
Motor learning/control theory	Learning complex motor tasks and technical skills	Using distributed rather than massed feedback to support motor learning
Neurophysiological theory	Effects of stress on learning and performance	Addressing levels of stress to optimize learning in simulations
Cognitive theory of multimedia learning	Design of learning formats and resources	Structuring learning tools and formats for optimum learning and retention with multiple media
Cognitive load theory	Design of simulation and multimedia learning modules	Reducing cognitive load to allow for better performance in practice
Learning theories		
Adult learning theory (including critiques)	Role of self-assessment and self-directed learning	Avoiding unstructured self-direction by using directed, guided self-learning
Situated learning theory	Awareness of learning context	Incorporating workplace features into educational design
Social cognitive theory	Role of social networks in learning	Paying attention to the development of social relationships in learning
Sociocultural theories		
Critical theories	Attention to the hidden curriculum arising from the effects of power inequities, hierarchies, and socialization	Addressing the hidden curriculum by making visible and mitigating hierarchies and power differentials and by improving the socialization processes
Political–economic theories	Attention to economic and political factors that drive behavior	Making visible/altering economic and political drivers of professional behavior

**This table presents a selection of bioscience theories, learning theories, and sociocultural theories that are relevant to GME. For each theory, the table provides an example of an issue within GME to which that theory is potentially relevant and a hypothetical example of a specific intervention which would be supported by that theory.*

Table 2 Examples of Graduate Medical Education (GME) Practices Aligned or Not Aligned With a Selection of Bioscience Theories, Learning Theories, and Sociocultural Theories

Practices **aligned** with a specific theory or theories, useful references, and abbreviation of theory type(s)*	Practices **not aligned** with a specific theory or theories, useful references, and abbreviation of theory type(s)*
GME objective: Learning technical/clinical skills: from simulation to bedside	
Longitudinal, progressive skills development[16,29,32 (BST)]	Excessive stress in simulation[11 (BST)]
Incremental learning with distributed feedback[15,42 (LT)]	One-shot training[16,18 (BST, LT)]
Transfer of skills to real practice setting[19,42 (BST, LT)]	No opportunity to transfer skills to real practice settings[19,42 (BST, LT)]
Learning and practicing skills in settings and with human interactions that are culturally consistent with real practice settings[35,45 (SCT)]	Lack of concurrent feedback[15 (BST, LT)]
	Too much multimedia[28,31 (BST)]
	Left alone to learn in a simulator[43 (LT)]
GME objective: Learning team collaboration: functioning as an effective member of real teams	
Progression from the periphery of teams to active participation[34,35,45 (LT, SCT)]	Team skills learned in isolation from practice[45 (LT, SCT)]
Awareness of power/hierarchy and the effects on team function[52,48 (SCT)]	No consideration of dynamics of power and hierarchy on team function[52 (SCT)]
Development of identity as a team member[46–48 (SCT)]	Exposure to hidden curriculum that devalues team collaboration[49–51 (SCT)]
	Development of inappropriate behaviors modeled by teachers or peers[46,49,63(SCT)]
GME objective: Gaining progressive independence: a focus on graduated competence in real practice settings	
Continuity of teaching and mentorship[41,42 (LT, SCT)]	See one, do one, teach one[42 (LT)]
Learning deliberately structured for progressive independence[41 (LT, SCT)]	Immersed into situations seen as a threat rather than a challenge[12 (BST)]
Linking personal tasks to overall health care goals[48 (SCT)]	Left alone to self-direct learning[37,43 (LT)]
Skills and performance scaffolded onto a defined knowledge base[23,27 (BST, LT)]	Short rotations with no development of progressive independence[41 (LT, SCT)]
Independent learning supported by training for self-monitoring[38 (LT)] and directed self-guided learning[39 (LT)]	Isolated knowledge and skills learning, unconnected to real health care roles[48 (SCT)]

**Some references use elements of more than one type of theory. These references were chosen not because they specifically address the practice elements included in the table but, rather, because they describe or use a theoretical perspective that would be consistent with engaging with or understanding each particular practice. BST indicates bioscience theory; LT, learning theory; SCT, sociocultural theory.*

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THE RESIDENT'S EXPERIENCE

FROM THE BOOK ENTITLED
"EDUCATING PHYSICIANS: A CALL FOR REFORM OF MEDICAL SCHOOL AND RESIDENCY"
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GRADUATE MEDICAL EDUCATION

As dramatic as the transformation from medical school matriculant to graduate is, the growth from beginning intern to residency graduate is even more remarkable. Four weeks after graduating from medical school, interns ("PG1s," for first postgraduate year) begin residency training, often in a new hospital in a new city (or country), neophytes in their chosen specialty, unfamiliar with their peers and supervisors as well as their new medical center's physical environment, protocols, and systems. Three to six years later, they depart, ready for subspecialty training or for independent practice of their discipline. Residency training gives medical school graduates the knowledge and skills required for practice of a specialty and the experience to apply their knowledge and skills with judgment and discernment. In the course of graduate education, they become their teachers' colleagues—and sometimes even their physicians.

In this chapter, we describe residency training as it is currently conducted in the United States. After an overview of the resident experience and a brief discussion of residency in the larger context of financing and regulation, we address in detail curricular structures, pedagogical practices, and approaches to assessment. We close with a discussion of key issues that affect how residents are supported in capitalizing on patient care opportunities to advance their knowledge, skills, and professional development. Through descriptive analysis and illustrative vignettes, we present examples of innovative approaches to residency education that we encountered in our fieldwork and highlight problems common to residency programs. In describing innovation, we draw particular attention to programs and

practices that recognize the progressive and participatory nature of clinical learning and the situated and distributed nature of clinical knowledge and skills, premises about learning that we discussed in detail in Chapter Two.

THE RESIDENCY EXPERIENCE

Megan O'Neale is a twenty-eight-year-old second-year resident in internal medicine at a community hospital affiliated with a nearby medical school. Now in the fourth month of her PG2 year, she is in her second month of inpatient medicine, having completed a month of CCU and a consultation rotation in endocrinology. It's 12:45 p.m., and, sandwich in hand, she has stepped out of noon conference (a presentation by a member of the infectious diseases division on initial selection of antibiotic treatment for patients with a variety of serious infections) to touch base with her two interns and one subintern before leaving the hospital for her weekly afternoon outpatient clinic. Over the remainder of her year, the middle of a three-year training in internal medicine, Megan will do three more months of general inpatient wards, a month in the emergency department, and an elective month in her community's Planned Parenthood clinic, learning contraceptive management. Today she will see six patients in clinic before returning to the hospital to evaluate the patients her team has admitted while she was gone. She will spend the night in the hospital and won't head back to her apartment until 1:00 or 2:00 p.m. tomorrow.

GME is a complex amalgam of experiential learning powered by graduated participation in patient care in a variety of clinical settings, informal one-on-one and group case discussions, and formal didactic instruction. Whereas medical school, particularly the first two years, emphasizes theoretical knowledge, principles, and general concepts, residency training is focused on the particular, using the residents' care of individual patients to support development of a detailed, nuanced experience with diseases and important clinical situations within their specialty. In addition to each resident's individual experience, GME is structured to afford substantial vicarious experience; thus residents learn not only from the patients they take care of but from good and bad outcomes experienced by their fellow residents' patients. At its best, the learning of residents is participatory, developmental and progressive, and situated and distributed.

The Learning Trajectory

From barely functional intern stymied by unfamiliar conditions, protocols, and systems to competent residency graduate capable of independent patient care across most of his specialty, the trajectory of a resident's learning can be characterized as a journey through a series of questions. For example, PG1s, caring for patients under close supervision and largely executing care designed by more advanced clinicians, are learning the answers to *how* questions: How do we assess the severity of community-acquired pneumonia? How are liver transplant patients stabilized postoperatively? How is an open appendectomy performed? Advanced residents are focused on *when* and *whether* questions: When should a patient with a low but real possibility of giant cell arteritis undergo temporal artery biopsy? Does this patient with pyelonephritis require admission? Should this patient with bowel obstruction from colon cancer undergo surgical decompression? As residents reach the final year of their training, they should have become competent in the usual management of common problems within their specialty. However, they are still on a steep learning curve with respect to advanced and complex problems within their specialty (Ringsted, Skaarup, Henriksen, & Davis, 2006).

Just as the nature of the residents' primary learning changes over the course of graduate medical education, the issues that they struggle with shift as well. Interns labor to master their new environments and learn how to get things done and how to function efficiently (Sheehan, Wilkinson, & Billett, 2005). In the procedural specialties, residents tackle progressively more challenging bedside and operative procedures. The first three years of a five-year general surgery residency is largely devoted to this technical mastery; in the fourth and fifth years, while gaining experience with the most challenging surgeries of the specialty, the residents learn to design management plans that their subordinates execute; to make decisions, often under conditions of significant uncertainty; and to tackle the *when* and *whether* questions. Because the tasks are so different, a resident who may have performed well under direction as an efficient, get-it-done intern can encounter significant difficulty as a team leader (Yao & Wright, 2005).

The "progressivity" of resident learning in the nonprocedural disciplines, such as pediatrics and family medicine, derives primarily from the greater role and increased responsibility they play in the care of patients, not from the fact that they are seeing different clinical conditions and learning procedures that are more technically demanding. The content of their learning is, of course, progressively more

specialized as well, and the residents learn this primarily through consultation rotations in the subspecialties of their fields and through their exposure to the allied specialties of medicine. Like their surgical colleagues, advanced residents in nonprocedural fields are challenged to make decisions under conditions of uncertainty. Equally, delegation and team management may prove difficult for residents who performed well as interns. In both the procedural and nonprocedural fields, it is likely that individuals destined to arrive at the end of residency training well prepared to care independently for patients within their discipline follow divergent trajectories in arriving at that state of competence.

International Medical Graduates

It is important to keep in mind that a significant proportion of GME trainees face additional challenges to learning during residency. As we noted in Chapter One, every year about 27 percent of the PG1s graduate from non-U.S. medical schools (Hart et al., 2007), most arriving in the United States solely to pursue graduate medical education. In addition to the challenges of a new working environment and responsibilities, international medical graduates may struggle to adapt to U.S. mores, acquire the language skills necessary to comprehend regional accents and appreciate subtleties in discussion of treatment choices, and make sense of the U.S. health care system.

REGULATION AND FINANCING: IMPLICATIONS FOR GME

In Chapter Five, we describe regulation and financing of GME in the larger context of regulation of medical education, but we comment on both throughout this chapter because of the implications for the resident learning experience. Until recently, unlike UME, residency education has seen very little experimentation and innovation, reflecting, we believe, an inherent characteristic of the system: it is conservative on a number of levels and actively resists change. For example, the residency review committees that define the content of GME for every specialty are typically composed of physicians who have served, or are serving, as program directors and who may find it difficult to imagine radical reorganization of residency training within their specialty. Also, because residents are engaged in a significant amount of patient care, medical center administrators tend to assign them where the patients are, regardless of educational priorities. Of course, advances in medical science and the advent of new diseases have changed the epidemiology of inpatient medicine, but residency remains largely a hospital-based clinical experience in which residents see and care for whoever happens to be hospitalized.

Emphasis on Inpatient Care

Because the central activity of residency is direct patient care, resident participation in the care of patients extends and builds on the PBL learning cycle described in Chapter Three. However, rather than teachers devising paper, video, or standardized-patient cases to raise learning issues deemed appropriate for students at a given point in their education, assignment of residents to settings where patients with particular conditions or disease processes of a certain severity are diagnosed and treated is (or should be) what creates the learning opportunities the program intends. In this way, Megan O'Neale will learn about contraceptive management because she has chosen to do a month at Planned Parenthood. However, residents are not always assigned to clinical settings that have the greatest educational value. Tradition and time-honored agreements between departments and among clinical units are influential. Even more dominant in most residency training programs is the medical center; because the dollars associated with GME flow through the medical center, not the residency training programs, the medical center director can (and typically does) deploy the residents where there is the greatest need, not where the residents' education will be best served. For this reason, Megan will complete residency with stronger inpatient skills than outpatient abilities because, as do almost all residency programs, hers requires spending the significant majority of her time in hospital settings.

The few changes that transpired before the mid-1990s primarily concerned the length of training in a specialty: the pyramidal structure of residency training, especially in surgery, has been abandoned and young physicians embarking on a residency can now expect to complete a requisite number of years, assuming they are academically and professionally capable. Similarly, "short tracking," or truncating the internal medicine residency from three years to two and allowing early entry into subspecialty training such as cardiology or endocrinology, has been largely abolished, except for those planning careers in biomedical research who short-track into physician-scientist training programs where the two years of residency and four of research add up to the same six years of a conventional three-year residency and three-year fellowship.

However, over the past ten years, the ACGME has become increasingly activist. A transformation in the approach to assessment of residents, shifting the metrics from so-called time-and-process measures, in which satisfactory completion of residency is determined by counting the number of months a resident spent on various

rotations, to a competency orientation is having profound effects on assessment programs and even on the structure and organization of residency training. Regulations governing shift length and mandating days off are likewise forcing reorganization of resident clinical assignments and creating an urgent need to make the graduate medical educational process more efficient. Meanwhile, concern is developing in some quarters about the absolute length of training, because it results in delayed delivery of surgeons to unsupervised practice (Coverdill et al., 2006) and of physician-investigators to independent researcher status (Zemlo, Garrison, Partridge, & Ley, 2000). This issue, combined with sharper focus on decreasing variability of approaches to common clinical problems and intense concentration on patient safety, is bringing significant external pressures to bear on the conduct of residency training. With this context in mind, we turn to the curriculum, pedagogy, and assessment of residency education.

THE RESIDENCY CURRICULUM

As with the third and fourth years of medical school, but to an even greater degree, the patients seen and the clinical care delivered by residents constitute the curriculum. Repeated exposure to common and important conditions and participation in management afforded over the course of residency amounts to a structural form of "deliberate practice" (Ericsson, 2004) and results in a deep reservoir of tacit knowledge (Norman, 2006) that underlies clinical judgment (Mylopoulos & Regehr, 2007). Here we look at the residency curricula: the rotations and formal and informal teaching and learning activities.

Clinical Rotations

The basic unit of the residency calendar is the rotation or clinical assignment. Although most rotations last one month, residents may be assigned to core experiences such as inpatient internal medicine on a particular hospital unit for two months, and some ancillary or adjunctive rotations may be as short as two weeks (for example, an internal medicine resident might have a very brief clinical experience in dermatology or office gynecology). During a hospital rotation, residents are typically assigned to a team or service, caring for all the patients or a subset of the patients on that team. As patients are admitted from the emergency department or the clinic, they are assigned to services according to a schedule designed to moderate and balance the workflow across all the admitting residents in the specialty. The resident and his or her team care for the patient until discharge. Some residency

training programs, most prominently in surgery, assign residents to faculty members rather than to geographical units or services. These three-to-six-month assignments, considered "apprenticeships," are intended to increase the resident's understanding of preadmission assessment and postoperative outpatient care, enhance the resident's understanding of the day-to-day professional life of a working surgeon, and facilitate establishment of a strong relationship between the resident surgeon and a faculty mentor. Although we did not encounter residency-level apprenticeship systems outside of surgery, it is likely that they exist, particularly in family medicine and in rural settings.

Continuity Clinic and Outpatient Blocks

Residents also have responsibility for care of outpatients. For surgery and many subspecialty rotations in internal medicine and pediatrics, these outpatient experiences are integrated into inpatient-based rotations. For example, a PG3 in pediatrics doing a pediatric rheumatology rotation at a referral hospital might spend the bulk of her time caring for inpatients hospitalized on the rheumatology service and doing consultations on other hospitalized patients, but also see patients in rheumatology clinic two half-days a week. Similarly, an orthopedics resident doing two months on spine surgery would spend most of his time in the operating room and much of the remainder caring for hospitalized postoperative patients, but likely would see outpatients with back problems in clinic as well. Although surgery is a hospital-based specialty, outpatient experience is critical to surgical training, as residents must learn to make a surgical diagnosis, select the operative plan, and care for the patient preoperatively and postoperatively. A variety of factors, including the increasing importance of outpatient surgery and duty-hour limitation, are making it increasingly difficult for surgical residents to participate continuously over an episode of surgical illness (Melck, Weber, & Sidhu, 2007).

Continuity clinic is a key part of the education of residents in the generalist disciplines, whether or not they will ultimately specialize. Residents in internal medicine, pediatrics, family medicine, and often neurology and obstetrics and gynecology have a panel of patients whom they care for over time. Continuity clinics may be longitudinally arranged, with the resident seeing outpatients the same half-day, week in and week out, or arranged in blocks of a month. Many programs, particularly those emphasizing primary care, use both designs. Some programs take this even farther, organizing pairs or teams of residents in a shared practice (Sharif & Ozuah, 2001). In this model, a pair or small team of residents shares care for a panel

of patients. The residents' schedules are coordinated so that when one resident or half the team is doing an intense inpatient rotation, the partners have an outpatient block and can care seamlessly for their colleagues' patients.

Resident continuity clinics are administratively challenging and often do not achieve the intended continuity or the desired connection among trainees, patients, and their families over time (Melck et al., 2007; Smith, Morris, Hill, Francovich, & Christiano, 2006; Smith, Morris, Francovich, Hill, & Gieselman, 2004). The patient no-show rate can be high, and many appointment slots are taken by other physicians' patients needing drop-in care. Continuity clinics have been additionally compromised by the mandates of duty-hour reduction. For example, the stipulation that a resident who has worked twenty-four hours overnight in the hospital not work more than six hours the next day prohibits an afternoon clinic following a night on call. Although this discontinuity compromises the ability of residents in outpatient settings to observe illness unfolding over time and the course of convalescence (neither of which is easily appreciated from the perspective of an inpatient unit), it does yield opportunities to strengthen skills in collaboration and team care. Unfortunately, because of limited resources for outpatient education, most residency programs have not capitalized on this opportunity.

Our observations suggest that training in ambulatory care needs increased attention across GME, from the outpatient-based generalist specialties to the subspecialties of surgery. Many of the deficits we observed reflect the intrinsic difficulty of the work: the short visits and time pressures, lack of clinical definition of many problems seen in the outpatient setting, and intermittent patient availability for reassessment. Further, because no education funds are associated with resident education in outpatient settings, the teaching faculty are often attempting to see their own patients while supervising residents. Moreover, medical education's commitment to outpatient education has been limited. Although medical students, and likely the public, tend to regard inpatient medicine as particularly intense, complex, and challenging, the demands of outpatient medicine with its high-stakes distinctions that must be made between potentially very ill and not-so-sick patients should not be underestimated or underrepresented in residency training.

Skills, Research, and Other Rotations

Residency programs are increasingly providing options for residents beyond clinical care in their home program. Rotations may be designed to accomplish specific

goals in clinical skills development, often without direct patient care involved. For example, Atlantic Health's procedural skills block for PG1s allows interns to learn and practice procedures fundamental to inpatient medicine—venipuncture, IV insertion, placement of a Foley catheter, lumbar puncture, arterial blood gas sampling, and so on—under the supervision of phlebotomists, nurses, and physicians. Once the intern can perform the procedure at an appropriate level of proficiency, either on a fellow intern volunteer or in a simulation setting, she is credentialed to perform it on patients under her care. Likewise telemedicine rotations, where residents learn skills in telephone management and distance consultation, augment the skills residents learn in face-to-face care of patients.

To meet the ACGME requirement that all residents learn the methods of scholarship; gain experience collecting, analyzing, and presenting medical information; and contribute to the field, residencies offer research blocks for advanced residents. In large academic surgery departments, for example, residents are often required to do a year of research. Work abroad is increasingly popular as well, and many large academic programs offer opportunities in global health.

Curriculum Didactics: Meetings and Conferences

It is 7:00 a.m. and a small group has gathered in the hospital cafeteria. Dr. Paul Starker is meeting with two surgery interns at Morristown Hospital, part of Atlantic Health. Over coffee and muffins, Dr. Starker guides a discussion of repair of inguinal hernias. Using a gentle Socratic approach, he explores the interns' understanding of methods of repair, their pros and cons, and the history of various technical approaches. Taking a piece of paper, he makes informal diagrams to reinforce his teaching points. At 7:45 a.m., the three head off to clinic.

The formal and informal activities that contribute to the residency curriculum range from frequent attending rounds to monthly departmental meetings. Several times a day, for example, residents meet with their faculty supervisor to discuss the patients on their service. They may sit down together in a conference room, or the resident and faculty member, with or without the other members of the team, may move from room to room, checking on patients and reviewing the diagnostic thinking and next steps for care. These daily scheduled meetings, called attending rounds, allow the faculty physician to probe the knowledge base and understanding of the students and residents on the team, observe the teaching and leadership of the most senior resident on the team, and offer direct teaching.

In the cognitive specialties (internal medicine, pediatrics, neurology), the residents assigned to the inpatient service meet daily with a senior physician, perhaps the chief of the service, or several senior physicians to discuss newly admitted patients and those who present interesting, instructive, or difficult diagnostic or management problems. This meeting, called residents' report or morning report, is organized by a chief resident selected to do an extra year on the basis of exceptional clinical and teaching skills. Residents' report allows peer teaching (Smith et al., 2009), as well as the input of the near-peer chief residents and the senior faculty physicians. At USCF, the chief residents in medicine prepare one-page written summaries of complicated or unfamiliar issues discussed in residents' reports. These summaries are posted on the department's website. Morning report is typically the teaching conference that residents most highly value (Gross, Donnelly, Reisman, Sepkowitz, & Callahan, 1999). However, its dynamics require careful attention to achieve appropriate rigor while avoiding an excessively competitive or intimidating environment. Although the morning report is most characteristic of the cognitive specialties, some surgical residencies have experimented successfully with it (Stiles et al., 2006).

Much teaching at the resident level occurs as informal clinical discussions. As was previously noted, residents typically take advantage of the fact that their entire team is assembled in the hospital on admitting days to go over a common issue in the discipline or teach about a topic they have recently reviewed in response to a patient problem. Faculty do much the same thing: an attending on a medicine service, discovering that the previous evening of admissions has brought two patients whose serum sodium is low though for different reasons, may spend fifteen minutes in attending rounds leading the PG1s in interactive discussion of the differential diagnosis and initial evaluation of hyponatremia. Expecting that the topic is comfortable for the PG2, the attending may offer the resident the opportunity to correct a misunderstanding on the part of one of the interns, thus assessing both the resident's knowledge and her approach to teaching. Likewise, except when a technical challenge or an untoward development commands everyone's full attention, much time in the operating room is spent in clinical discussion.

Of course, there are many scheduled teaching conferences as well, such as the noon conference Megan O'Neale attended on empiric use of antibiotics. The ACGME demands that every residency program have a formal curriculum and document how it is delivered to the trainees. Traditionally, this "delivery" has been accomplished through early morning, lunchtime, or preclinic conferences, but some residency programs are now devoting a half-day to resident education. Arrangements are

often made for residents to pass off their pagers so that the educational sessions are not interrupted by clinical chores. At Henry Ford Hospital, the education half-day for the surgery house staff begins with an hourlong session attended by all. The group then splits up by year of training for didactics appropriate to each level. Residency programs with a strong component of longitudinal outpatient experience typically have a thirty-minute clinic conference preceding or following clinic and covering common problems in ambulatory care in the discipline or featuring a challenging diagnostic or management problem. In an effort to ensure the consistency of coverage of content, regardless of which faculty member is supervising, and to accommodate residents who are unable to attend conferences because of schedule conflicts, core content is now being made available to residents online. This kind of asynchronous teaching is effective if the faculty are engaged and hold their residents responsible for the web modules (Maddaus, Chipman, Whitson, Groth, & Schmitz, 2008).

Grand rounds is the most venerable of the traditional teaching conferences. Originally, this was a clinical discussion, often with the patient present. A resident, or perhaps a community physician, would present the patient's history and then a professor would call attention to important features of the history and physical examination and conduct a learned discussion of the condition at hand. Now more commonly it is a weekly fifty-minute formal conference, emphasizing recent research or review of a clinical topic. The educational value of this exercise has been questioned (Hebert & Wright, 2003; Mueller, Segovis, Litin, Habermann, & Thomas, 2006).

Departments hold a morbidity and mortality (M and M) conference weekly to monthly. This systematic review of complications that have occurred on every clinical service is a requirement of the Joint Commission (until 2007, the Joint Commission on the Accreditation of Health Care) but is also an important occasion for teaching. Historically, residents regarded M and M with trepidation because they were often pilloried for complications and poor patient outcomes, sometimes despite executing care specifically directed by a faculty member. Increasingly, discussions in M and M are being structured so that the focus is less on individual culpability, or "blame and shame," and instead more on system failings (Bates, Shore, Gibson, & Bosk, 2003; Gore, 2006; Kravet, Howell, & Wright, 2006; Prince et al., 2007). Through these conferences, residents see faculty modeling responses to error and learn skills such as root-cause analysis.

During our fieldwork, we observed some conferences where residents were present but the educational potential of the moment was underused. Discharge planning rounds is one such conference (Mistiaen, Francke, & Poot, 2007) that we consider a missed opportunity. This multidisciplinary conference, attended by nurses, social workers, at least one member of the physician team, and often others, focuses on making arrangements for patients whose hospital discharge is likely to be complicated by a poor home situation, complex medical needs, cognitive challenges, behavioral difficulties, or some combination of these and other problems. Discharge planning rounds seemed to be regarded by the residents as a clinical administrative chore, a sort of necessary evil and not a learning opportunity—a perception perhaps reinforced by the faculty supervisor rarely being part of the discharge planning group. This is, however, an important opportunity to observe residents collaborating with nonphysician members of the health care team and engaging in systems-based practice. We found no descriptions of GME-level programs focused on the discharge planning process, corroborating our sense that this is an overlooked but promising forum for interprofessional education. Perhaps the escalating attention to quality and publicity about the startling readmission rate for Medicare patients will raise the stature of this exercise.

Stimulated, Directed, and Self-Directed Learning

In the process of delivering supervised care, the experience with patients, either as individuals or collectively, raises questions in the mind of the resident or causes her to recognize knowledge or skill gaps. These questions and gaps should stimulate learning, encouraged and guided as needed by faculty and other supervisors and participants in care. In fact, given the distributed nature of information in the clinical environment, something as simple as a discussion about a patient with his nurse or with a medical student who was a physical therapist before enrolling in medical school may result in learning. However it occurs, the obligation to provide high-quality care should lead to recursive assessment of the match between the resident's knowledge and skills, the capabilities of the care team, and the needs of the patient (Croskerry, 2003; Kuiper & Pesut, 2004). If the patient needs more than the team can deliver, it is the responsibility of the resident, with the support of the supervising faculty member, to correct the mismatch.

Reading is the primary method by which residents address knowledge gaps. However, surprisingly little is known about how much residents read and what their sources of information are (Lai et al., 2006). Furthermore, there have been

obvious, widespread, and profound changes in how medical learners, and residents in particular, relate to the medical knowledge base. A generation ago, third-year students used simple textbooks; interns relied heavily on spiral-bound manuals, and residents tackled the key textbooks of their specialty, leavened as their graduate training progressed, by the reading of original papers. Many of these references are now available online, but more has changed than the method of access; there is now a vast array of just-in-time information sources, the market leader being UpToDate (http://www.uptodate.com). Investigators at the Mayo Clinic exploited the fact that the software tracks use (the time during which a topic is open, and whether a topic is printed) to evaluate the association among accessing the electronic resource, attendance at clinical conferences, and year-over-year improvement on the In-Training Examination (ITE). Adjusted for demographics and prior achievement, self-directed use of the electronic resource twenty minutes or more a day was associated with a 4.5 percent improvement in the ITE score, comparable to the 5.1 percent improvement associated with an additional year of residency education (McDonald, Zeger, & Kolars, 2007). However, some faculty members told us they are concerned that, given the easy availability of authoritative information from sources such as UpToDate and the stipulations of duty-hour reduction, residents are not investing in reading to build their fund of knowledge and deepen understanding as they did in the past. Perhaps paradoxically, individuals in residency programs with a less strong academic history may actually be reading more, with their reading monitored by faculty members, in an effort to attain or maintain an acceptable board passage rate (de Virgilio, Chan, Kaji, & Miller, 2008).

Journal Club

Residents conduct many formal didactic sessions, including talks expected as part of consultation and elective rotations, resident-led clinic conferences, capstone presentations given by graduating residents and chief residents, and journal club. Journal club is typically a monthly exercise that is intended to be a forum for discussion of recent papers in the specialty as well as a mechanism for residents to learn how to assess the quality and import of clinical research papers; residents are expected to select an original research paper, not a review (Alguire, 1998). The critique of the investigative methods is as important as the clinical conclusion; the presenting resident is expected to lead a discussion that culminates with the question, "Will this study change my practice?" Both procedurally oriented specialties and cognitive specialties such as internal medicine hold journal clubs. However, because large randomized clinical trials are less common in disciplines

such as surgery, in those areas the research literature tends to focus on developing and testing innovative technical approaches. Some journal clubs are more broadly focused, emphasizing, for example, the perspective and experience of the patient (Cave & Clandinin, 2007).

Teaching By Residents

Residents also teach subordinates. In addition to formal exercises, such as presentation of a topic review during a consult month or leading a discussion of a paper at journal club, residents conduct impromptu teaching sessions and teach almost continuously in the course of supervising the patient care given by their juniors. Both the resident teachers and their team members benefit from this teaching, the junior members for the usual reasons and the residents because they often must further their own understanding in order to articulate concepts and approaches to beginners and are sometimes required to research a topic to adequately respond to a student's questions (Boud, Cohen, & Sampson, 2001; Sobral, 2002; Tang, Hernandez, & Adams, 2004).

Even first-year residents, neophytes themselves, are expected to support the learning of their juniors, the medical students on the service. These teaching responsibilities expand as residents progress; a fifth-year surgery resident will assist his third-year resident in learning surgical approaches of moderate complexity as well as beginning to address the *when* and *whether* questions of surgical management. He will also oversee the third-year resident's teaching and supervision of the interns and students on the service. Likewise, a third-year pediatrics resident doing an inpatient rotation at a large teaching hospital will oversee several PG1s, a third-year student, a fourth-year subintern, and perhaps a pharmacy student or nurse practitioner. Admitting days offer a particularly rich stimulus for learning and teaching, both because newly admitted patients bring new conditions and problems to consider and because there is frequently some downtime in the interval between admissions.

PEDAGOGIES FOR RESIDENCY EDUCATION

What a resident learns in the course of her residency education is not the result of random patient care experiences. It is purposeful and developmental and reflects—or should reflect—a careful structuring, sequencing, and progression of roles, activities, and responsibilities to support learning. When an activity is at the

boundary of a resident's competence, the attending will create an opportunity for low-stakes practice by asking the resident to describe the care he intends to administer ("Tell me what you make of this and what you are planning to do") or having the resident perform the care under direct observation, or both. On Megan O'Neale's team, for example, the resident has a similar relationship with the intern, and the intern has a comparable relationship with the third-year student. This highly structured set of relationships, characterized by layers of delegation and supervision, operates to allow clinical learners at various points in training to focus on practicing tasks they have just learned and on pushing the boundaries of their skills and understanding to the next level while avoiding undue risk to patients (Carraccio, Benson, Nixon, & Derstine, 2008; ten Cate & Scheele, 2007).

Whereas medical students' interactions with patients often feature just one element (taking a history, examining the heart, placing a Foley catheter), residents' interactions engage patient care more holistically. Correspondingly, although those who supervise residents may use decomposition, breaking down of tasks or concepts, and other approaches to simplify the learning task (Grossman et al., 2009), pedagogies at the graduate level tend to be multipurpose. Thus two distinctive features of clinical teaching at the residency level are (1) the dominance of peer- and near-peer teaching and (2) the complex role of the faculty supervisor, who serves as the teacher, the supervisor of care and guarantor of quality, the team leader (a role shared with the senior-most resident), and in some cases the patient's own long-term physician.

Although contemporary conceptions from the learning sciences focus on the student, the teacher is nonetheless important. The relationships that attendings establish with residents on a clinical rotation powerfully affect those residents' estimation of the learning value of that rotation (Kendrick, Simmons, Richards, & Roberge, 1993). The distributed sources of teaching make the environment for learning at the residency level rich and stimulating. Because of the complexity, any discussion of how teaching occurs at the resident level must necessarily simplify quite dramatically. For example, our discussion focuses on physician-to-physician teaching, though there are of course others in the environment who have significant expertise but no explicit teaching role (most important, nurses).

In contrast to the powerful teaching that happens in the course of patient care, the planned teaching sessions on preset topics and other formal didactic settings that we observed were largely unadventurous. We saw many examples of resident

conferences with chairs arranged in rows, Microsoft PowerPoint presentations, minimal interaction between the presenter and the residents, and no peer-to-peer discussion intended or encouraged. In general, UME educators are more actively experimenting with novel pedagogies, such as team-based learning, to promote learning in large-group and formal settings than are their GME colleagues.

Pedagogies for Conceptual Understanding

As in UME, case discussion is GME's signature pedagogy. However, the primary point is no longer mastery of the form, as it is for medical students, but exploration of the presenter's underlying understanding and creation of opportunities to invite the participation of other learners. Usually, the case is used in clinical discussions about patients that the team is responsible for, but skilled teachers use it to good effect in formal settings as well.

Forty-some general surgery residents of various levels are gathered in a well-appointed small amphitheater for their educational half-day. The teacher is an energetic young radiologist; the topic for the session is Interesting Abdominal CT Scans. The faculty radiologist has brought several of her learners, radiology residents doing an interventional radiology rotation, with her. She projects a CT image, provides a thumbnail clinical sketch, and gives the group a minute to study the scan. Then she poses a question: "What do you see?" Remarkably, she seems to know the names of most of the surgery residents. Calling on one of the PG2s, she asks for a description of the salient findings. She then turns to a PG3 for the differential diagnosis and asks one of the radiology residents to refine the surgeon's suggestions. At one point, she asks the radiology residents to discuss how the information that the surgeon puts on the requisition assists them in the reading room. The atmosphere is lively and friendly, but many of the patients presented are gravely ill. The stakes are clear, and all the residents are quiet, engaged, and attentive.

Case discussions involve considerable to and fro. How they are perceived by learners and their effectiveness as a teaching strategy depends on the atmosphere established by the teacher. If the questions asked are low-level (Wilen, 1991), with a definite right answer and involving an obscure point of factual knowledge, learners will hesitate to participate, particularly in teaching situations where multiple levels of learners are present, for fear that a more advanced learner (or even worse, a less advanced learner) knows the answer to a question that the person called on cannot

answer correctly. However, skillfully managed large-group case discussions are an engaging and efficient approach to teaching (Barnes, 1994). Some work has been done with resident learners that demonstrates how learning can be potentiated through use of audience response systems (ARS); residents had modestly greater learning gains at the conclusion of the teaching session and much better retention three months later when small-group case-based teaching was augmented by ARS (Pradhan, Sparano, & Ananth, 2005; Schackow, Chavez, Loya, & Friedman, 2004). Questioning is a particularly characteristic approach to teaching in the operating room. Again, quizzing, or, as it is commonly called,"pimping" can either make learners afraid to take risks or, if the appropriate level of challenge and support is given, energize and excite learners (Brancati, 1989; Detsky, 2009).

A central function of the case discussion is to make visible the reasoning underlying the clinical formulation and management strategy for a particular patient. The teacher may interrupt a case presentation to create progressive disclosure and give other members on the team an opportunity to participate. We saw many examples of attendings pausing one intern's presentation to ask a second intern, "What would you be thinking of at this point? What would concern you most?" These high-level questions present learning opportunities at no risk to the patient. As learners practice case formulation and propose approaches to management, the faculty physician and more senior residents gain insights into the developing sophistication of their junior colleagues. Residents greatly appreciate the invitation to propose management strategies. As one surgical resident remarked,"The best question an attending can ask is, 'What do you think we should do?'" Rather than having residents, who are of course relatively advanced learners, simply execute the management strategies of their attendings, posing such questions allows the teacher to build a strong sense of the resident's fund of knowledge, attention to key findings, and ability to prioritize. Any ensuing negotiation of the care plan is an opportunity for the resident to notice where her plan did not match the attending's and where she may have a knowledge gap.

The numerous occasions of resident teaching are also an opportunity for residents to reflect on and improve their approaches to instruction (Busari & Scherpbier, 2004). Work rounds, the daily or twice-daily bedside visit conducted as a team, with the acting intern or intern presenting an update to the team on patients' changes in clinical status and diagnostic test results, afford rich opportunities for residents to explore their subordinates' understanding of patients' conditions.

Pedagogies for Practice and Performance

Clinical medicine is a practice and is learned through experience. Asking how clinical medicine might be taught and learned in a way that is safe and respectful for patients and learners alike (Berry, 2008; Kennedy, Regehr, Baker, & Lingard, 2005) is a complex question. The attitudes embodied in the approaches to resident learning express the professional values of the field and affect, potentially significantly, the capabilities of new residency graduates. In other words, even though it might seem desirable to have residents practice under conditions of quite constrained independence, to the extent that they do not exercise their own decision-making capabilities and do not undertake challenging procedures while they are in an educational environment, with support and supervision, they will presumably have to learn to make those same decisions and do those same procedures as independent practitioners. Having decisions made and procedures performed by the most experienced physician available is not a bad thing, but it comes at a cost.

The trend over the past three decades has been to more closely supervise residents; it is accelerated by concerns about patient safety, despite evidence that teaching hospitals provide safer and higher-quality care than do hospitals that do not host graduate medical education (Allison et al., 2000; Ayanian & Weissman, 2002). This trend is combined with an absolute and dramatic increase in what residents have to learn as a result of development of new techniques and advances in medical science and a 24 percent decrease in the average resident work week as a consequence of duty-hour reduction mandates. Residents and their teachers are concerned that there simply is not enough time in residency training to become competent and prepared for independent patient care at the completion of residency training. This concern is particularly acute in the procedural fields, where practicing motor skills is essential to achieving acceptable performance (Grady, Batjer, & Dacey, 2009).

Thus, in all residencies attendings are available twenty-four hours a day to hear cases and advise regarding management. The rules governing when the resident must discuss care with the attending vary from program to program and within resident-attending pairs. Some faculty members ask to be called for every new admission; others, believing that one of the key things residents should be learning is when they need help, allow more latitude (Stewart, 2008). Typically, however, the faculty supervisor would expect to be notified in real time of significant changes in clinical status (raising the possibility of transfer to the intensive care unit, for example) and patients needing imminent surgery.

Simulation

The opportunity to practice decision making and procedural intervention in settings where the well-being of actual patients is not at stake is now recognized as one way to address some of these important practical and ethical challenges (Wayne et al., 2006). Simulation is generally associated with high- or low-fidelity facsimiles of physical environments, mannequins, and procedures. However, as we suggested earlier in discussing teaching through cases, it is important to recognize that teachers who ask questions of the *what-if* type are creating intellectual simulations. For example, a skilled teacher in a nonprocedural field, faced with a routine admission, will put a twist on the question to allow learners to practice at a higher level of challenge than the patient at hand actually affords.

One of the strengths of simulation is the opportunity it creates for residents to isolate the elements of complex procedures, such as surgery, and practice them in a progressive sequence. This breaking down, or decomposition, of complexity can make it easier for learners to appreciate and master the component steps. For example, computer science students at the University of Washington, in collaboration with faculty in the department of surgery, have developed computer programs in which the steps of such common surgeries as herniorrhaphy, appendectomy, and cholecystectomy are represented on a computer screen as images of the operative field (see http://www.isis.washington.edu/classes.html#T1). The trainee's task is to select, in proper sequence, the correct instrument from a tray also shown on the computer screen and touch the appropriate place in the "operative field" with the virtual instrument. Certainly, this has nothing to do with the ability to operate on live patients or even to correctly maneuver real surgical instruments, but it does require that the surgery intern learn the steps of the operation and the associated instruments and proceed through the surgery in the correct sequence. Only then does the intern move on to using the actual instruments in a box trainer.

Some residents believe that simulations are better suited to familiarization with surgical instruments than actually learning how to perform procedures because mannequins and models do not display the anatomical variation found in nature and because it is difficult to represent the "feel" of handling living tissue (or haptics) persuasively. Conversely, very low-fidelity simulations can be a powerful learning experience if the learner engages with the premises of the simulation and takes the experience as real (Hamstra, Dubrowski, & Backstein, 2006).

Simulations also afford an important opportunity for doing and redoing complex care under conditions of pressure, or even crisis. The leaders of the simulation center at the University of Washington stress the importance of designing simulation exercises that are ambitious enough to create the opportunity to learn in multiple domains in one exercise. As an example, the director described being approached by a faculty member in urology who wanted a simulation on the placement of a suprapubic bladder catheter for his residents. The director persuaded the faculty member to think more broadly, and the result was an emergency-room simulation involving nursing students, a medical resident, and a urology resident. The "patient" presents with symptoms the nursing students should recognize as likely bladder outlet obstruction. The nursing students and medical resident work together to pass a Foley catheter but have difficulty. Together, they are expected to recognize when they need the assistance of a subspecialty colleague. Finally, the urology resident, also unable to pass the Foley catheter, does the suprapubic procedure. The simulation was broadened beyond a simple technical skill to cover interprofessional communication, assessment, judgment, consultative skills, and patient reassurance.

Similarly, simulations can be organized so that they benefit a broader group than just those with a role to play. At the University of Florida campus in Jacksonville, we observed a mixed group of internal medicine residents, emergency medicine residents, and nursing students working on a severe asthma simulation. An emergency medicine faculty member initially played the agitated, dyspneic patient until intubation was required; the patient role was then taken by a mannequin. Although there were only three or four active roles, the simulation was attentively observed by a group of about twenty, taking notes on a structured form. When it came time to debrief (a critical element in effective simulation), the observers were as much a part as those who had been hands-on participants.

From Learning Skills to Practicing Procedures

Eventually, of course, learners must apply their growing skills to the care of real patients. Creating systems and strategies to allow residents to acquire and practice skills, gain experience and develop judgment, and feel the weight of responsibility for the well-being of their patients is at the heart of clinical teaching. Despite their obvious contrasts, both procedural and nonprocedural disciplines approach this similarly: by making careful assessments of a resident's capabilities and offering him or her opportunities, under supervision, just beyond the limit of those capabilities. Aspects of care that the faculty supervisor is confident the resident can address

unaided are delegated to the trainee to be performed independently, although the faculty member remains responsible. The attending or another more senior physician takes on the elements of care that the resident has not mastered, often with the resident assisting or observing.

To offer challenging learning opportunities for residents who are working toward competence as independent practitioners, while ensuring that patients receive care of the same quality they would receive were trainees not involved, at least three conditions must be met (Kennedy, Lingard, Baker, Kitchen, & Regehr, 2007). First, physician teachers must be able to correctly gauge the capabilities of their juniors, specifically the decisions and procedures they can undertake without direct supervision. If attendings are not able to do this accurately, quality of care may be compromised as residents make decisions or perform procedures with insufficient knowledge and skill. Likewise, resident learning will be compromised if the person is oversupervised and micromanaged in performing elements of care that she is capable of on her own. Second, residents must be able to identify when a situation is beyond their abilities or experience (Berry, 2008; Stewart, 2008); of course, this is a necessity for all physicians, not just those in training. Third, having identified the resident's "learning edge," faculty must be able to construct opportunities that provide challenge and allow the trainee to build skills and gain experience without hazarding patient safety.

In the cognitive specialties, in which nuanced judgment is paramount, the developmental progression stems not so much from having residents engage with progressively more challenging diagnoses over their graduate medical education but from playing a more central and responsible role. Thus an intern in internal medicine will perform a history and physical examination of a newly admitted patient with community-acquired pneumonia. She would be expected to be able to generate an appropriate list of diagnostic possibilities to account for the patient's symptoms, physical findings, and laboratory abnormalities, but not to act on her diagnostic impressions. At the PG1 level, this experience with management decisions would be acquired largely through verbal practice. Only after more junior residents have repeatedly rehearsed complex care do they begin to take on components of it, under supervision.

In the case of specialties in which procedural and technical competence is central, developmental educational progression is achieved by having residents learn and practice first the simple parts of simple procedures, then the more complex

parts, and then the entire procedure. They proceed to the simpler parts of more demanding procedures, and so on. In surgery, for example, residents progress from observing to assisting with minor components of a surgery, to the role of first assistant. The first assistant stands on the opposite side of the table from the surgeon and essentially "co-operates." This requires detailed knowledge of the surgical procedure, the ability to adjust to anatomical variations and unexpected developments, and familiarity with the operating surgeon's procedures and preferences. Then, initially with more straightforward procedures and ultimately with complex operations, the resident takes the role of the operating surgeon and the faculty member serves as the first assistant. The attending surgeon thus cedes "motor control" but retains visual and overall control; if he believes that the resident is going off track he may try to guide indirectly, perhaps by suggesting another exposure. Failing that, he may provide direct instruction, or in more extreme circumstances resume motor control (Moulton, 2010). In this manner a surgical resident progresses from doing an incision and drainage under direct supervision while still an intern, to performing a hemicolectomy as a late third-year resident, and then executing a complex vascular procedure such as an abdominal aortic aneurysmectomy as a fifth-year resident nearing completion of training.

Of course, faculty surgeons vary in their willingness to entrust the role of operating surgeon to a resident; this can be a particular challenge for more junior faculty who may lack confidence in their ability to assess a resident's skill level, prevent a misadventure, or recover from a resident error. Some surgery departments, including the Department of Surgery at Northwestern University, have faculty development programs intended to assist younger faculty members in learning supervisory styles that decrease their need to take over the case. At the Mayo Clinic, where surgery residents spend several months at a time in an apprenticeship pairing with a faculty surgeon, the pairings are based largely on the faculty member's pattern of practice. A surgery teacher, regardless of seniority or stature, who is quite reluctant to cede the operating surgeon's position to a resident, would be paired with a PG1 or PG2, for whom the observer or assistant role is appropriate, whereas a surgeon just starting his career would be partnered with a PG4 or PG5 if he is able to work confidently from the first assistant position.

How well can attending physicians judge the ability of residents? A study at the University of Washington assessed the psychomotor skills of surgical residents at a low-fidelity task trainer for minimally invasive surgery. Beginning residents performed far less well than faculty physicians in terms of fluency and economy of motion and

avoidance of excessive force. Residents made modest gains over years one and two of residency, associated with opportunities to learn and practice simple procedures. The second and more substantial gain in psychomotor skills was seen over the fourth and particularly over the fifth year of residency, as the surgical residents tackled (under supervision) more demanding procedures, including advanced laparoscopic procedures. Perhaps more important, in the second phase of the same study faculty surgeons were asked to review the videotapes of the task trainer performance. They were able, with only brief observation, to identify the level of the trainee simply by watching him or her move the instruments (Rosen, Hannaford, Richards, & Sinanan, 2001).

At its best, supervision is unobtrusive, but this unobtrusiveness does not mean the resident is functioning autonomously. Good teachers construct a "learning space" for residents, setting an appropriate level of challenge while ensuring that the care the patient receives is equivalent to the care he would have received if the faculty physician were treating him directly. Midlevel and advanced residents contribute some elements of care without direct observation by an attending, reflecting the faculty physician's determination that the resident's skill level is adequate to the complexity usually encountered in the setting and the attending's confidence that the resident recognizes the bounds of her capabilities (Teunissen, Boor, et al., 2007). In this situation, there is regular communication between the attending and the resident, and the attending is available to come to the bedside when needed. This progressive delegation is important for the maturation of the resident, who needs to be ready to practice independently at completion of the residency.

Pedagogies for Inquiry, Innovation, and Improvement

Residency education, like medical education in general, is overwhelmingly focused on bringing learners up to speed with the current state of the art. However, pedagogies that concentrate on conveying today's knowledge and skills may fail to prepare residents to unlearn today's practices and learn new concepts and approaches. More important, teaching approaches that treat today's understandings and methods as the end goal of education represent medical knowledge as static and fail to recruit residents as field builders in medicine.
Done effectively, an evidence-based approach to discussion of diagnostic testing strategies and treatment selection can serve to highlight areas in which field building is needed. Residents who are expected to justify their proposed diagnostic or therapeutic approach will need to develop an awareness of the state of their

specialty. For a particular clinical situation, is the proposed treatment solidly established as preferred by virtue of multiple clinical trials, rigorously compiled as a systematic review, supported only by a consensus of experts, or merely endorsed by local custom? Evidence-based medicine is sometimes regarded as inimical to intellectual approaches more based in fundamental mechanisms and hence linked to the sciences underlying medicine, but this is a false dichotomy (Timmermans & Angell, 2001). "Basic science thinking" generates hypotheses that can, and should, be tested in clinical trials; conversely, empiric observations can generate ideas about possible basic mechanisms to be explored in the laboratory. Thus pedagogies that support learners in preparing for productive inquiry use an orientation to evidence-based medicine that holds residents responsible not only for knowing what to do but also for the level of evidence that a particular approach is better. In addition, where the basis for preference for one treatment over another is weak, residents should be encouraged to think about what better evidence would look like and how it might be acquired.

Ideally, when feasible, residents should be encouraged to proceed to implement the studies they devise; the Goldman Cardiac Risk Index (Goldman et al., 1978) is an example of a study conceived and undertaken collaboratively by residents at a single institution, to the benefit of patients and an entire specialty. Teachers should press residents to consider what a clinical trial might mean with respect to pathogenic mechanisms and to generate testable hypotheses. The resident who knows that, as of 2009, many clinical studies have not demonstrated a benefit of tight glucose control in preventing cardiovascular events in patients with diabetes should be encouraged not to stop there but to wonder why this might be, in terms of fundamental mechanisms.

Pedagogies for field building must constantly focus the attention of learners not just on what they do not yet know but on where medicine's gaps are (Bereiter & Scardamalia, 1993). These are not *how* questions; they are not even *whether* or *when* questions. They are *what next* questions: What do we need to understand better to deliver effective care to patients? Sometimes these are basic science questions: What do we need to understand better about the pathogenesis of this condition? Residency programs, particularly in the large training programs based in schools of medicine, have traditionally aspired to train future academics and have recruited medical school graduates who already possess a track record of participating in research. Many GME programs make it possible for residents to participate at least modestly in a research investigation during residency; most

academic surgery programs expect residents to take one to two years during residency to work in a lab. However, not all important questions in medicine have to do with fundamental mechanisms, for the answers to very practical questions can be field builders as well (How can the treatments that we know benefit patients be more effectively delivered?) In fact, very few of the sixteen thousand students who graduate from U.S. medical schools every year will engage in basic science or clinical research, but all practitioners can engage with questions of designing their own practice to improve the effectiveness of the care they provide and improving the health of their community.

Increasingly, residents are undertaking mentored quality-improvement projects (Krajewski, Siewert, Yam, Kressel, & Kruskal, 2007; Philibert, 2008), like the one in the internal medicine residency at the University of Pennsylvania that we describe later in this chapter. Many projects of this type conceptualize the resident's work environment, whether an inpatient unit or an outpatient clinic, as a microsystem (Nelson et al., 2002). Residents, along with other participants and stakeholders, are empowered to study the microsystems in which they find themselves, identify their shortcomings, develop improvement plans, actually make changes in the processes of care, and then restudy the system to ascertain if the desired effects have been achieved (Tess et al., 2009).

Teaching approaches that support development of skills in system redesign involve both the interactions of individual faculty members with residents and, even more important, creation of possibilities within residency programs and the medical settings that house them. Residency training programs must leave more time for trainees to engage seriously with this set of competencies, and medical center and hospital administrators must invite residents into the venues in which important operational and management decisions are made. In addition to the benefit that could accrue to the systems on which residents focus their attention, this type of work allows residents to acquire a broader knowledge base, develop skills in interdisciplinary collaboration and teamwork, and cultivate the professional attributes required to do difficult work in systems change. Rather than excluding residents, medical centers should include their trainees, and use their intimate and detailed experience with what works well and what does not to improve processes of care.

Because this is unfamiliar territory for faculty and trainees alike, it is ill suited for formal didactic teaching methods; role modeling and coaching are likely to

work better. However, there is formal knowledge associated with domains that residents will encounter when they begin to undertake work in systems redesign and community engagement; collaborative exploration of new literatures, such as that found in organizational development (Madsen, Desai, Roberts, & Wong, 2006), change management, accounting and financial controls, quality improvement methodologies, and teamwork, will be useful. Helping residents access this knowledge in palatable forms and furnishing tools so that early ventures have some reasonable prospect of success is important in minimizing frustration with this often messy work. Emphasizing the iterative nature of learning through cycles of experience undertaking change, reflection, and a next attempt, such as the plan-do-study-act (PDSA) cycle, is an important teaching strategy, as is building in the understanding that doing the work of patient care and improving the work are two interdependent pieces of the physician's role. The experience of residents caring for patients can be used to engage their interest not just in how health care is delivered in the medical systems in which they work but in how it is organized and financed regionally, statewide, and nationally (Jacobsohn et al., 2008).

Of course, the most familiar field-building work undertaken at the GME level is research. In many ways, wet lab research conducted by residents illustrates what we believe should be more broadly available across the domains of inquiry, innovation, and improvement. The resident is welcomed as a legitimate junior partner in the laboratory or clinical research environment, one who undertakes initially simple but necessary elements of the program of investigation. As his sophistication and capabilities grow, he is allowed, and expected, to tackle more demanding activities. The entire endeavor is based on the premise that a fundamental goal is to create physicians who are capable of, and intent on, generating new knowledge. Why should it be any different for residents whose interests incline them toward designing improved systems of health care delivery or working at the policy level to create a health care system that is more accountable, effective, and just?

A number of medical schools have developed programs at the undergraduate level to encourage, and in some cases require, medical students to engage in field building across the broad range of inquiry and improvement activities that physicians engage in. Examples are the Areas of Concentration program at the University of Pittsburgh and the Scholarly Concentration program at Stanford University School of Medicine. However, in part because residency programs have tended to exist in departmental silos and because medical center administrators and department chairs have been reluctant to assign residents to settings and activities that are not

explicitly linked to direct medical education funding (DME) and indirect medical education (IME) funding, GME has lagged significantly. This is beginning to change, albeit slowly. UCSF has developed Pathways to Discovery, a program conceived as a complement to the clinical curriculum of medical students, residents, and fellows. Participants will choose one of five pathways: molecular medicine (wet lab basic science), clinical and translational science, global health, health and society (policy studies and advocacy, community engagement, humanities and medicine) or health professions education. While completing their clinical training, they will do master's-level work combining didactic course work and original scholarship.

Pedagogies for Professional Formation

It is a Tuesday afternoon and internal medicine residents, PG2s and PG3s, are gathered in a conference room in their outpatient practice. One of the residents has brought a patient to the group. The topic for the session is poor adherence. The resident and her patient review for the group the difficulties that the patient has had with weight loss and smoking cessation, both essential elements in management of her diabetes. After this introduction, the faculty teacher for the session takes over and begins working with the patient, using the principles of motivational interviewing. The conversation with the patient lasts ten minutes or so; before excusing her, the teacher asks the patient if she has any questions. She asks several of the observing residents where they are from and what their plans are, and she wishes the entire group well. Once the patient has gone, the faculty member facilitates a discussion of "difficult patients." One of the residents comments, "It's not the patients who are difficult; it's our response to them." This leads to a candid and supportive exploration of patient care experiences that they have found challenging.

Residency education is holistic; it is therefore difficult to isolate pedagogies that are dedicated to supporting professional formation, that is, the dimension of becoming a physician that has less to do with fund of knowledge and technical skills and more to do with the character, disposition, and automatic choices, the moral compass, of the trainee. The simplest and most easily discerned elements concern the knowledge that practicing physicians require about ethical standards and legal requirements (Arnold & Stern, 2006). Many residency programs have a regular conference devoted to this material; at UCSF, this content is addressed in the Healthcare Ethics, Law, and Policy series. The conferences mix didactics, covering, for example, the change in California law requiring written informed consent for

HIV testing, and case discussion. Likely more powerful, however, is the lived-out example—how faculty members and the program treat challenges that residents deal with as they care for patients, interact with fellow physicians and nonphysician members of the health care team, and take on leadership roles in clinical services and in nonclinical arenas, if they have this opportunity.

Ordinary clinical work regularly poses extraordinary challenges and can be associated with significant psychological morbidity (Golub, Weiss, Ramesh, Ossoff, & Johns, 2007). Making decisions under conditions of uncertainty, being called on by patients and families for advice when the stakes could not be higher, making the wrong choice and being forgiven (or not), being entrusted with intimate confidences never before shared, and being a witness to the beginning of life and its end are all part of the daily experience of residents. Mistakes and bad clinical outcomes are part of the territory of clinical medicine and hence of residency training. These untoward occurrences are part of the curriculum of graduate medical education. Much formation of professional character arises as residents learn to deal with these inherent difficulties, accepting responsibility and reflecting on achieving better results in the future, but avoiding paralyzing self-doubt (Paget, 2004). As a program director observed, "When mistakes happen, residents have to learn to be appropriately self-critical. One size does not fit all." Teachers often help trainees negotiate this difficult terrain; good listening skills, strong empathic capacity, willingness to be appropriately self-disclosing, and the ability to promote reflection characterize effective teaching in this domain.

Some residency programs have regular, scheduled sessions intended to help residents process the challenges of clinical work in a supportive atmosphere, minimizing isolation and offering guidance on dealing with patient death, interpersonal conflict in clinical settings, and errors (Bragard et al., 2006). Sometimes called "stress rounds," these are often thought of as being more appropriate for the junior house staff and are less commonly available for residents in the later years. Not surprisingly, residency programs with a culture of rugged individualism are often skeptical of what they consider touchy-feely sessions. Across the board, these programs require a charismatic faculty champion to lend credibility, establish ground rules, facilitate productive discussion among the residents, and demonstrate through his or her own participation how to reflect on and cope with the inherent difficulties of practice.

Among the purposes of many advising systems is to create one-on-one relationships that residents can use ad hoc, as they encounter not just career decisions, academic hardships, or personal difficulties but challenges to their professionalism. Just the commitment of program resources to an advising system sends an important symbolic message; however, approaches that rely exclusively on assigned pairings organized centrally are typically compromised by weak and ineffective relationships when personal chemistry is lacking. Henry Ford Hospital uses a hybrid approach: PG1s work with an assigned advisor, and in subsequent years residents choose their advisor on the basis of shared interests and personal compatibility. An effective advising system that is capable of moving beyond counseling about fellowship options is likely to be especially important in large academic training programs, where a single GME program may have scores of residents and most faculty members spend only a small portion of their time teaching.

A final point bears emphasis: we regard ethical comportment and aspiration to the highest goals of the profession of medicine as being situated and distributed in the clinical environment. How their peers, their program, and the culture in which they are working, learning, and living treat these challenges and residents' responses to them can either inspire trainees or breed cynicism. The contextual and cultural factors that support or impede residents' becoming the physicians their programs want them to be—and their patients need them to be—have just recently attracted much attention. Just as knowledge and technical know-how is situated and distributed, so professionalism is as much a feature of context and the culture of the specific environment as it is an individual asset (Goldstein et al., 2006; Humphrey et al., 2007; Viggiano, Pawlina, Lindor, Olsen, & Cortese, 2007). Residency training programs, and more broadly the clinical settings in which residents are placed, must hold themselves much more accountable for the environments they foster. The macro environment and microsystems in which residents work and learn may call forth the best from them, because a high sense of purpose pervades the setting; others in the environment reliably demonstrate integrity, respect, and humility; and conflict is managed openly and collegially. Or residents may be held to one set of professional values, while the context in which they are working is entirely otherwise. At the very least, residents who are required to hold to the highest standards of professional behavior but expected to work in an environment where faculty are tardy, give inadequate supervision, and verbally abuse house staff and each other will become cynical about their professionalism expectations. Worse, they may begin to emulate the behavior they see around them.

Unfortunately, the microsystems, and in some settings the entire macro environment, in which residents learn are not always conducive to proper professional formation. Furthermore, we believe that complex issues relating to the number of hours residents have been expected to work have become confused with the quality and meaning of their work experience. Assuredly, residents have been exploited in the past by their residency programs and medical centers. However, simply decreasing the number of hours of a poor-quality experience does not make it more salutary. Conversely, even though this is not intended to encourage residency programs to flout duty-hour reduction requirements, residents may miss profoundly important patient care experiences, the ones physicians remember at thirty years' remove as having forged a part of their identity as a healer, if they slavishly depart the bedside of a dying patient at 2:00 p.m. or leave a surgery with forty-five minutes to go because of the twenty-four-plus-six rule. Without argument, residency programs have needed the discipline of formal duty-hour reduction rules, with significant sanctions for noncompliance, but the process has had unintended and deleterious consequences. One of the saddest may be a shift in how residents regard investigating their patients' condition, acquiring new understandings stimulated by a desire to take outstanding care of a patient on the service, or developing a teaching aid to help a third-year student on the team understand a fine point of localization of a neurologic lesion or some subtlety of renal physiology. Duty-hour reduction has led some residents to regard all patient care activities as having a dimension of burden from which they need to be protected. This connotation can contaminate not just residents' bedside activities but how they regard reading and researching clinical topics at home. Residents have been heard to say that once they are off they should not have to invest personal time in learning about their patients, even though the ACGME states explicitly that "duty hours do *not* include reading and preparation time spent away from the duty site" (Accreditation Council for Graduate Medical Education, 2001).

These challenges notwithstanding, most residents see among their peers, students, and teachers many outstanding examples of compassion, commitment, dedication, and excellence and choose wisely which examples to follow and which to regard as cautionary. Perhaps the best example of a culture relentlessly calling for and supporting dedication and service to patients that we encountered in our fieldwork is the Mayo Clinic. When asked for an example of professionalism, an internal medicine resident at the clinic told a story about a peer. The resident colleague was caring for a patient with widely metastatic cancer. The patient had come from a European Union country, having been told by his physicians there that his cancer

could not be cured. The patient arrived in Rochester, confident that the prognosis would be different if the treatment were designed and delivered by Mayo physicians, but was told again that the best medical science could not cure his malignancy. The narrator described his friend, caring for a patient who was thousands of miles from home, who had to communicate with his physicians in a nonnative language, and who lacked the money and perhaps the physical strength to make the return trip, as well as the resident's intense desire to do something for his lonely, frightened patient. He discovered the patient's favorite beer, spent his afternoon off looking for it, and smuggled it into the inpatient unit so that his dying patient could have a simple pleasure that reminded him of home. Although recognizing that the action was quite possibly a violation of hospital policy, we, like our narrator, regard this as a wonderful example of professionalism. This story was told to us in 2005 as contemporaneous. By chance, one of the authors ran across a recounting by the protagonist that was published in 2009. The author was contacted and reported that the incident occurred in the late 1980s. Either it has become part of the lore of the Mayo Clinic or it has happened more than once (Peter Ubel, M.D., Professor of Medicine, University of Michigan, personal communication July 2009).

Residency programs often do a good job as well in celebrating residents who consistently display qualities of character and the devotion to patients that are hallmarks of the "true physician." Many programs honor an intern of the year; typically, these recognitions reflect outstanding character and ethical comportment in addition to well-developed clinical abilities. In the cognitive specialties, it is an honor to be invited to do an additional year as a resident, the "chief resident" (not to be confused with the chief resident year in surgery, which reflects a level of responsibility that must be attained by all residents in order to complete the training program). In residencies that have such an honor as a chief resident year or awards such as intern of the year, the professionalism of the candidate is a key factor in selection.

ASSESSMENT IN RESIDENCY EDUCATION

In Chapter Five we outline external assessment of residents' skills and knowledge as part of the profession's licensing and certification process. Here we discuss assessment within residency programs, which has traditionally combined in various proportions formal knowledge assessment through periodic testing, direct observation of the resident's care of patients, and indirect inferences based on residents' discussion of clinical problems in settings such as residents' report and

M and M, and more formal discussion of clinical topics, journal club articles, and research projects. More recently, patient logs are being used, particularly in the procedural specialties, to yield an inventory of the resident's technical experience, while global assessments capture domains such as professionalism and interpersonal skills. The limitations of contemporary assessment include poor compliance with the performance assessment system on the part of faculty members (Littlefield et al., 2005), overweighting of knowledge, highly variable direct observation of performance from specialty to specialty and across residency programs (Holmboe, 2004; Williams, Klamen, & McGaghie, 2003), and insufficient and poorly accepted formative feedback.

Assessment of Knowledge

Assessment of knowledge is, in general, accomplished well in residency training. Programs use standardized in-training examinations to assess resident progress, anticipate performance on the end-of-residency board certification exams, and evaluate their own success in giving trainees productive clinical experiences and useful didactics (Babbott, Beasley, Hinchey, Blotzer, & Holmboe, 2007). Because residency programs are assessed in part by the pass rate of their graduates on the specialty board certification examination, and because medical school graduates understandably favor programs with demonstrated success in preparing their residents for the specialty certification process, less-competitive residency programs often devote more attention explicitly to preparing residents for the exams and use the in-training exams extensively, both as practice and to detect residents likely to have problems (de Virgilio et al., 2008).

Assessment of Procedural Skills

Procedural skills are assessed by direct observation, and increasingly in the simulation lab. Medicine and surgery training are an interesting contrast in this area, for a number of reasons. First, residents in medicine and many other procedurally oriented specialties simply do far fewer procedures than a generation ago. Subspecialty fellows perform liver biopsies and bone marrow biopsy and aspiration; intensivists and surgeons perform central line placement and thoracentesis; many simpler procedures such as paracentesis are performed in the radiology suite, with ultrasound guidance, and quite often by the radiologist. Even the procedures that are performed by the resident are often done in the absence of a faculty member because, in the nonprocedural specialties, most resident-faculty contact time occurs

away from the bedside in conference settings such as attending rounds. Therefore supervising teachers typically have little opportunity to assess residents' aptness in performance of procedures. This is generally true in such specialties as internal medicine, but the growing use of hospitalists as supervisors of residents doing inpatient rotations in medicine and pediatrics may result in more opportunities for observation. Hospitalists are presumably more adept at inpatient procedures and more available for supervision than the multiply committed university faculty member or community attending. The situation is quite the opposite in surgery, where faculty members spend many hours across the operating table from their residents. As we noted earlier, there is empirical support for the contention that attending surgeons can gauge a resident's technical competence and assess its appropriateness for his or her level of training by direct observation. However, some surgery residencies are compromised by very large size. In these large academic training programs, because the PG4s and PG5s supervise and observe the PG1s, PG2s, and PG3s, a resident may become a PG4 before the faculty become aware of significant, and perhaps irremediable, technical deficiencies. Teachers at several large programs we visited spoke poignantly of the challenges of counseling an inept resident who has already devoted three or more years to the rigors of surgery training.

Because of problems of this type, residency programs, especially surgical programs, are becoming much more systematic about procedural skills assessment. Skills verification programs in which residents must request faculty observation of the performance of level-appropriate technical interventions are more prevalent than ever. Southern Illinois University (SIU) has developed the Objective Structured Assessment of Technical Skills (OSATS). However, it has not been widely accepted because it is time-intensive for faculty members and results in reduced operating room time for interns compared to programs where interns are allowed to participate in simple operative procedures without prior demonstration of a threshold level of technical competence. Asynchronous review of resident videotapes by faculty is being explored in an effort to make the OSATS more feasible for widespread use. SIU, a leader in surgical education and in assessment in particular, also uses an explicit operative performance rating system (OPRS). Recognizing that the exact clinical exposure of an individual resident cannot be entirely controlled or predicted, the OPRS identifies two "sentinel" operative procedures per year of training that residents are certain to have the opportunity to participate in and that call on skills expected at that level of training. Residents must be observed and formally assessed on several occasions per year on each of that year's OPRS surgeries.

Taking the lead from this kind of program, it would not be difficult for residency programs in the nonprocedural specialties to select sentinel skills that they regard as critical in development of competence and then mandate observation and formal assessment. These skills might or might not be procedural. For example, a residency program in internal medicine might require observation early in the PG1 year of interns giving hospitalized patients discharge instructions, or examining a patient with acute dyspnea in the role of the cross-covering PG1. Midway through the year, the sentinel skills in intravenous line placement, arterial blood sampling, and catheterization of the bladder could be assessed; this observation and assessment could be delegated to residents with proper training on performance standards and feedback. Late in the PG1 year, the assessment might focus on development of an appropriate assessment and management plan for a patient with a cardinal symptom such as abdominal pain or altered mental status. PG2 residents might be observed and assessed conducting a "do not resuscitate" discussion and developing an assessment and management plan for a patient with a complex presentation, selected from a list of presentations seen with some frequency at that medical center. PG3 residents might be observed and assessed in a consultation role and working with a teamwork challenge, such as an interservice conflict or a problematic subordinate, or simply developing an effective relationship with the nurses and other nonphysician health professionals in an inpatient or outpatient setting. Initial work along these lines has been described (Torbeck & Wrightson, 2005).

Assessment of Professional Formation

As we emphasize throughout this book, we prefer the term *professional formation* to *professionalism* to underline the continuous, dynamic, multifaceted, and profound nature of the construct. Building on an essential foundation of clinical competence, communication and interpersonal skills, and ethical and legal understanding, professional formation necessarily extends to aspirational goals in performance excellence, accountability, humanism, and altruism (Arnold & Stern, 2006). It is especially important to acknowledge the contrast with "mere" competence at the level of graduate medical education, though the current, useful emphasis on competency standards has the potential to obscure the distinction (Brooks, 2009). In developing the competency framework, the ACGME quite deliberately chose the midpoint of the Dreyfus skills-attainment continuum of novice, advanced beginner, competent, proficient, expert (Batalden, Leach, Swing, Dreyfus, & Dreyfus, 2002; Carraccio & Englander, 2004). This choice reflects the belief that the public deserves, at a minimum, competent clinicians, and that the level of practical experience and

clinically driven learning required to achieve true expertise cannot be attained within the time envelope of the most efficient residency training program. However, in addition to their obligation to produce competent graduates, GME programs must ensure that their residents develop the personal characteristics to ensure lifelong commitment to the aspirational goals of excellence, accountability, humanism, altruism, and continued progress toward expertise after completion of training.

Because it is a complex construct, dimensions of professional formation often appear in assessments designed to focus on knowledge or procedural skills. During one of our site visits, a teacher of obstetrics and gynecology showed us a videotape of a resident responding to a relatively low-fidelity simulation of a delivery complicated by shoulder dystocia. The resident capably performed the required maneuvers and expeditiously accomplished the delivery but was visibly stressed, which she acknowledged. When asked about this response, the faculty member, extensively experienced in simulations for residents, said that it was usual; residents with desirable professional attributes "willingly suspend disbelief" while residents who refuse to believe the simulations quite frequently had other attitudinal difficulties. He has not tested the idea, but he speculated that, although the simulation was designed to primarily assess residents' ability to manage this obstetric emergency and secondarily to communicate with and reassure the frightened mother, it could be used as a marker for problems in professional formation. Other simulation experts have made the same suggestion (Hamstra et al., 2006).

In addition to formal assessments, there is much information about residents' professional attributes distributed in the environment within which they work. Unfortunately, this rich source of potentially valuable feedback to residents is incompletely captured, largely because potential informants, such as nurses, are not included in the evaluation process or because other residents are reluctant to share what they know. Because of its complexity, professional formation is best evaluated in authentic contexts, and those who work most closely with residents are in the best position to contribute (Norcini, 2003); indeed, even though their contributions are important, supervising faculty may have relatively little high-quality information on which to base their assessment of residents in this domain. Residents certainly know who within their peer group they would trust with the care of a family member; the key is creating a nonpunitive culture in which residents will share such knowledge of their colleagues. At Atlantic Health, residents nominate peers who they believe know their work well; the program director may add names to the list of resident evaluators. Are the evaluations truly candid? Some potential cross-checks exist:

chief residents are typically close to resident scuttlebutt and could verify whether formal comments are concordant or discordant. Also, it is generally well known which residents are popular supervisors of more junior trainees and, in residency programs associated with schools of medicine, medical students. Although this popularity reflects sense of humor, enthusiasm for teaching, and other attributes that are not strictly components of professional formation, subordinates do tend to seek out supervisors who strive for excellence, are compassionate and gentle with patients and their families, and are otherwise admirable role models (Kenny et al., 2003).

The fundamental prerequisite for successful collection of this type of distributed information about resident professional formation is a culture that creates a shared understanding of its legitimacy and importance (Maudsley, 2001; Viggiano et al., 2007). If residents believe that their program will use insights they furnish to punish or disadvantage a peer, they generally will not share the information, even if they have significant concerns. However, if the purpose is to help every resident take better care of patients and residents have available appropriate and effective assistance, programs may be able to obtain forthright assessment from residents.

The perspective of nurses is similarly valued or discounted, depending on the culture of the program. Although most programs have mechanisms through which nurses may complain about individual residents, surprisingly few systematically collect feedback from nursing staff. To some extent, this may reflect structural challenges. In large teaching hospitals, a resident may care for patients scattered over four or five units. When this is the case, there may be insufficient contact for nurses to form an opinion and for residents to take their comments seriously. A geographic organization of resident teams would likely promote development of more engaged and functional interprofessional relationships and facilitate participation of nurses in assessing residents.

Some programs have experimented with standardized patients in a "mystery shopper" format. With adequate authenticity, these can be powerful assessment tools. However, it is expensive, and for this reason repeated sampling is not feasible. Like other simulations, fidelity seems to become an increasing issue as the residents progress in experience; advanced residents indicate that working with real patients is more useful to their learning.

Self-Assessment, Reflection, and Portfolios

A number of assessment methodologies are being recommended to address ACGME competencies underrepresented by formal testing and episodic direct observation. It is hoped as well that some of these approaches will become habits of mind for trainees and thus support continued professional development after completion of residency training. Clinically driven learning is premised on the assumption that physicians can identify gaps in their capabilities, knowledge, or skills and are motivated to correct them, once identified. It has been shown that practicing physicians do not accurately self-assess (Colthart et al., 2008; Eva & Regehr, 2005), but beginning students in PBL programs have no problem identifying topics to learn about, stimulated by a paper case. Why this ability erodes over the course of training is not clear, although it may be that educational programs misrepresent the goal of medical training as production of physicians who have mastered a knowledge and skill base and are thus competent. The object instead is to nurture and challenge medical learners and inculcate the aspirational goal of lifelong learning. Extension and refinement of the skills addressed at a basic level in PBL through explicit attention to residents' skill at identification of new learning goals and use of appropriate and effective approaches to self-learning might mitigate the observed deterioration in accuracy of self-assessment. As has been discussed with respect to other dimensions of professional formation, this has a clear cultural aspect. Settings in which residents, and physicians in general, are celebrated and rewarded for what they know, or claim to know, will not promote acknowledgment of deficits that are learning opportunities. This type of environment may be exactly the influence that leads physicians to overestimate their capability to avoid the dissonance associated with admitting a gap.

By contrast, learning and practice environments in which it is understood that all physicians practice imperfectly and that the best physicians actively seek out evidence that they have a performance gap (whether the evidence is a trifling intuition of insufficient knowledge, unsatisfactory patient outcome data, or results from a more formal self-assessment program) and work to address these gaps once discovered could support maintenance of skills in reflection and self-assessment. Pedagogies involving reflection are intended to make visible this process of physician self-assessment (Branch & Paranjape, 2002); reflective exercises in which residents review and critique their performance and make plans for next steps to improve are a growing part of assessment of complex competencies such as practice-based learning and improvement and systems-based practice. As in UME,

interest in portfolio assessment has grown in parallel with the desire to assess medical learners in a broader range of domains than clinical knowledge and the belief that learners benefit from the process of reflecting on their work and selecting products and accomplishments to showcase (Driessen, 2009; Driessen, van Tartwijk, van der Vleuten, & Wass, 2007). Work in inquiry and improvement, such as a clinic-based quality improvement project or advocacy efforts on behalf of a vulnerable or underserved population, is particularly amenable to portfolio presentation. Aspects of professional formation can also be highlighted in a portfolio.

GME: THE WORK AHEAD

The many strengths of U.S. residency education are derived primarily from the intellectual ability and motivation on the part of the learners and the stimulation and challenge of the learning environment. That residency education is remarkably impervious to change is evinced by fundamental curricular structures, instructional approaches, and assessment techniques, many of which have been in place since its inception. Its many long-standing weaknesses, or fault lines, have been exacerbated by the dramatic changes in how health care is delivered in the United States. It is worth noting that this stasis in GME has had important implications for UME, as much of the clinical education of medical students is accomplished by assigning them to resident teams. For this reason, until the past ten years much of the change effort in UME focused on the first two years of medical school.

Pedagogy in resident education needs attention at two levels. First, faculty preparation for teaching should be significantly enhanced. Many faculty members could use assistance in using institutional resources for the benefit of their learners. However, residency programs are strikingly "siloed," even in a single university or medical center. In contrast to UME, teaching improvement efforts, to the extent that they are undertaken at all, are small-scale efforts within a department. Faculty members need support for development of their skills. As with all teaching, clinical teaching is challenging, and every teacher can benefit from opportunities to advance pedagogical content knowledge, observe good teaching and be observed, and reflect (Gruppen, Frohna, Anderson, & Lowe, 2003; Steinert et al., 2006). Formal faculty development programs focused on the important skills of clinical teaching, such as diagnosing problems in clinical reasoning, are extremely important. Perhaps equally critical is creation of a "teaching commons" where ideas about teaching are shared and built on (Huber & Hutchings, 2005).

Our other critique of pedagogy at the residency level concerns emphasis on current factual knowledge. A strong grounding in the contemporary knowledge base is absolutely necessary, but far from sufficient. Although much lip service is accorded "lifelong learning," most medical teaching occurs from an "authoritative expert" stance. Such a stance leads to difficulties: faculty members may feel anxious when confronted by a teaching situation for which they are not entirely in command of the medical knowledge base, and it also creates unreasonable expectations for learners in terms of their own growth and development. Those moments when physicians—whether faculty or residents—notice that they cannot adopt the authoritative expert stance are an opportunity, not a failing. It can be difficult, in a culture that celebrates expertise, to relish not knowing, but of course this is where continued learning comes from. Collegial pursuit of a good question should be a fundamental element of teaching at the residency level.

The scope of assessment in GME needs to be broadened and the methods diversified. Current approaches overemphasize current factual knowledge and underemphasize knowledge seeking and skill building. The relative paucity of assessment methodologies is related to overemphasis on factual knowledge, although whether GME educators have restricted the scope of resident assessment because they place less priority on nonknowledge domains or have overweighted knowledge because it is relatively easy to measure is not clear. Even though all residency programs have learning objectives for each resident rotation, a system for assessing whether residents have actually met those objectives is commonly lacking, as are mechanisms for alternative rotations or doing the assigned block at a more advanced level for residents who have achieved the basic objectives of a particular rotation. Developing and testing approaches to remediation of residents whose performance is not meeting goals is required as well (Torbeck & Canal, 2009).

Omitted and Neglected Content

As important as these comments about instructional approaches and assessment are, the principal deterrent to change in GME is that the residents' curriculum—what they spend their time doing rather than their formal didactic program—has been determined primarily by the needs of hospitals to have residents help with busy inpatient services rather than focused on what individual residents and cohorts of residents need, from an educational perspective. Along with a system of assessment that has focused on time spent in specified activities rather than exhibited competence and departmental "siloing" retarding the spread of curricular strengths

from one department to another, this has inhibited educational innovation and resulted in numerous curricular deficiencies.

In virtually all residencies and across all specialties, graduate medical education is dominated by attention to highly practical, even concrete issues: how to accomplish what absolutely must be accomplished in the hospital and then discharge the patient. Discharge becomes the highest goal. Most residency programs, across specialties, devote excessive time to inpatient settings, and despite the increasing severity and complexity of conditions encountered in outpatient medicine, they subject residents to poorly organized, educationally unproductive ambulatory care experiences. Residency education privileges learning settings in which all participants are physicians and fails to explicitly address the distributed nature of clinical intelligence and the critical importance of effective interactions with nonphysician members of the health care team. Largely because of the pace of the clinical environment, residency affords insufficient time for reflection, study, and consideration of the connections between a patient's situation and the foundational sciences. This decreases (if not eliminates) the opportunities for residents to speculate on where their field is going next and what questions need to be addressed to improve patient outcomes. As a consequence, a great range of content is underrepresented in the residency experiences, from underlying basic science to the social purpose of medicine.

Basic Science

In Chapter Three, we argued that medical students need clinical experience to put their "high science" learning in an appropriately patient-centered context. The situation in graduate medical education is the reverse; residents need the opportunity to step away from the practical exigencies of patient care to connect their developing know-how with the cutting edge of their field, to address the *whether* and *why* questions. We believe that medical learners should not regard basic sciences simply as prerequisites for clinical learning but rather as the living foundation of practice in residency training and through a life of practice.

Why does a practice-bound resident need to stay conversant with basic science concepts and the growing edge of the field of medicine? What does science actually have to do with clinical medicine? A strong foundation in both the traditional basic sciences and the behavioral sciences established in medical school and further developed and expanded during a lifetime of practice permits the intellectual

flexibility on which adaptive expertise depends. It is not enough to have time-proven and reliable approaches to routine problems; every physician requires a depth of understanding that allows him or her to respond to unusual clinical problems with original rather than habitual approaches (Bereiter & Scardamalia, 1993; Bransford et al., 1999; Hatano & Oura, 2003; Linn, 2007). It is, in fact, this ability that should distinguish physicians from non-M.D. clinicians. A second significant benefit of continued attention to the scientific foundations of medical practice is the relative ease of incorporating new discoveries. A clinician who depends on lists and who practices in an algorithmic manner must entirely abandon the list or algorithm whenever a new discovery disrupts it. By contrast, a physician who has remained connected to science, who has been following, for example, the story of interfering RNAs or the working out of genetic determinants of drug metabolism, is ready to incorporate discoveries into practice as what was cutting-edge science becomes a new insight into pathogenesis or an addition to the therapeutic armamentarium.

Thus medical educators need to be concerned by evidence that once medical students complete the "science phase" of their education, science rarely makes an encore appearance, and when it does it is isolated from clinical content in a research block (Kanna et al., 2006). Although they have merit, research blocks do not address the broader question of how to encourage all residents to update their basic science knowledge base and participate, even if they intend to be full-time clinicians, in field building by playing their own part in "translation," that is, helping to identify important questions for scientists to address. The question of how much of the basic science that physicians learned in the early phase of medical school is actually retained into residency and beyond has been contentious (Custers, 2008), but there is no debate that, given the accelerating rate of medical discovery, physicians need to stay abreast of the relevant foundational sciences. However, experiments in bringing basic scientists to attending rounds have been, by and large, unsuccessful. The imperative in the clinical environment is efficient patient management and swift disposition of problems; this task-focused environment is inhospitable to exploration of areas of emerging science, even those relating to the patients at hand. Still with the correct support and with enough time, residents and medical students alike can be encouraged to consider such questions as "What do we need to discover next or understand better to have more impact on this patient's condition?" and "What do fields like neuroscience or medical genetics offer in terms of increasing our understanding of this problem?" Innovative programs demonstrate that residents and fellows appreciate engagingly presented basic science that is highly relevant to their clinical work (Clark & Simpson, 2008; Hammond, Taylor, Obermair, & McMenamin, 2004).

Identifying the appropriate teachers is challenging as well. Even in large academic health centers, laboratory scientists have had little enthusiasm for teaching in a clinical environment. It is typically difficult to find a patient whose problem plays directly to the very narrow expertise of a particular laboratory researcher, and most wet lab investigators are not particularly comfortable at the bedside. Additionally, a significant majority of the seven thousand residency programs in this country are not based at academic health centers and thus do not have easy access to scientists. The clinical teachers supervising residents in their patient care and providing clinical teaching are not experts, either. However, it may be that the model is wrong. Perhaps what is needed is not a science expert at the bedside, the person with the answers, but a culture that values productive questions. The solution to this problem may lie less in bringing the expert with the answer to the resident and more in encouraging the resident and his or her teacher to ask the questions. Residency educators must become more creative in approaches to bringing concepts in the foundational sciences to the bedside, without relying on wet lab scientists to do all the teaching in this area.

Underemphasized Clinical Content

Because residents (and, indeed, all clinicians) learn by caring for patients, what they learn depends on what they see. Residency programs are insufficiently deliberate and intentional in organizing resident rotations to ensure that trainees encounter the clinical problems they will manage as independent clinicians, in the settings in which they will see those problems. This discrepancy is particularly problematic for such specialties as internal medicine, pediatrics, and neurology (Arora, Guardiano, Donaldson, Storch, & Hemstreet, 2005). For hospital-based specialties such as surgery and radiology, residency training better approximates how practitioners spend their time. Because they emphasize outpatient care in their training programs, family medicine and psychiatry also achieve a reasonable facsimile of the independent clinician's work.

It has been rationalized that it is appropriate for trainees to spend more time in inpatient settings than they will after completion of residency because hospitalized patients represent the severe-illness end of the clinical spectrum; so, it is argued, a physician who is capable of caring for hospitalized patients is prepared for anything. However, this argument fails on several counts. First, even very ill patients are now cared for entirely as outpatients more than ever. Keeping in mind the premise that learning is highly situated, it follows that what one learns about caring for a

patient with a particular condition—say, a markedly elevated blood sugar—in the hospital will have limited pertinence when trying to treat an outpatient with the same condition. In many ways, outpatient care is more demanding, because the patient is not continuously available for reassessment and adjustment of treatment strategies. Second, there are a large number of important conditions for which patients are never hospitalized. When residency training overemphasizes inpatient settings relative to what practicing clinicians do, residents leave their programs underprepared to care for people whose problems are largely addressed in an ambulatory setting.

We do not intend to suggest that the inpatient setting lacks merit as a teaching site. Inpatients tend to have more physical findings and are, of course, more available for repeat visits for teaching with learners of different levels. The gravity of much inpatient illness affords opportunities for teaching about bad news, negotiating changes in the stance of care, and working with families under stress. The routines of inpatient care allow the attending physician to observe residents at the bedside and assist residents in advancing their team management and teaching skills. However, it must be acknowledged that outpatients are not merely less ill than inpatients; they are situated in different conditions, and different skills are required for their care.

Clinical Reasoning and Judgment

Medical teachers, of course, believe they are teaching clinical reasoning (Montgomery, 2006). Most educators have, however, only an intuitive sense of what clinical reasoning and judgment are and very little understanding of how to teach them; in fact, the constructs themselves are poorly defined (Moulton et al., 2006). One might recognize the trainee who is endowed with strong abilities and the resident with deficits, but most clinician-teachers do not follow the learning sciences and have not kept up with advances in the field of medical decision making. In addition, some educational cultures, both specialty-based and institutional, may promote residents' acquiescence to authority, thereby inhibiting development of judgment and advanced reasoning skills. In the course of our fieldwork, we heard, particularly in our conversations with surgical house staff, that some faculty members were resistant to appeals for evidence, and more generally to house staff skepticism, insisting that the attending's preferred course of action be followed simply "because" (Bhandari et al., 2003). Evidence-based medicine may be something of a culprit in its own right; physicians need the ability to access information; assess its quality; decide if it is pertinent to the patient at hand; reason from first

principles; and gather and weigh a variety of technical, sociocultural, and value-laden considerations and perspectives to meld them, with the patient, into a plan or approach, often under circumstances of considerable uncertainty, where time is of the essence (Timmermans & Angell, 2001).

Practical Systems Issues

Residents learn and care for patients in a system they cannot significantly influence, much less manage. As a consequence, a universe of skills and knowledge related to running a practice is omitted from most residency education (family medicine is an exception to the critique); setting up a practice, personnel management, payer and insurer issues, and regulatory compliance are common orphan topics. We occasionally saw some of these issues being addressed in didactic settings; examples include sessions on medico-legal concerns and an interactive conference for fourth-year surgery residents on billing and coding, but because residents are isolated from management of the clinics, inpatient units, and medical centers where they are being educated, these issues are not compelling for them. This is an important problem, not only because residents (at least those who plan to proceed into practice at completion of their graduate medical education) need to gain an understanding of these issues but because, immersed as they are in the clinical environment, residents have important insights into care delivery and systems operation that the administrators and executives in their clinic settings would be wise to capture and learn from.

Even more basic systems-based practice issues are often overlooked in GME. Although expected to skillfully manage a team composed of medical learners at various levels, and perhaps a podiatry student and a pharmacy student; and to coordinate care of patients by collaborating with nurses, occupational therapists, and nutritionists, residents are given little or no instruction in the basics of team management or time management (Stanley, Khan, Hussain, & Tweed, 2006). Even worse, residents practice in an environment where their faculty role models are characteristically dissociated from the rest of the care team. "Interestingly, physicians tend to be the weakest link in the coordination of both surgical care and medical care. Physicians' relational coordination with the rest of the care provider team tends to be systematically weaker than it is for any other care provider discipline despite the fact that physicians play a central role in delivering patient care" (Gittell, 2009, p. 21). At virtually every site visit, residents reported that their greatest challenge was learning to delegate and manage and that the most common form of

interprofessional conflict was with nurses. This situation seems likely to perpetuate itself indefinitely if not confronted and corrected.

Systems Improvement Methodologies

The current focus on patient safety and quality improvement is beginning to be reflected to a modest degree in residency programs (Batalden & Davidoff, 2007; Tess et al., 2009). However, much more ambitious efforts are required if graduate medical education is to produce physicians who are, across the board, capable of engaging the problems of our health care delivery system, making patient care more reliable, and producing better outcomes for patients. The problem, in general, is that residents are not empowered in their medical centers as agents of change. Whenever they are, improvements happen. At the University of Pennsylvania, PG1s in internal medicine do a clinic-based quality improvement project; a sampling of projects that made things better for patients is selected for presentation at grand rounds the subsequent year. At Northwestern University, PG4 surgery residents developed a system for identifying and analyzing "near miss" errors on surgical services; discussion of these near misses is now a valuable part of every M and M conference (Bilimoria, 2009). Programs that authentically engage residents in addressing gaps in the delivery of quality care and supply tools for their exploration and correction (Jacobsohn et al., 2008), such as use of PDSA cycles, should become universal in residency training.

Leadership is another underdeveloped area, despite every resident having repeated opportunities to serve as the leader of a team over the course of her education (Horwitz et al., 2008). Fortunately, many residents' prior experiences have offered considerable opportunities to experiment with approaches to leadership and deal with challenges associated with building a sense of common purpose, establishing group norms, and dealing with conflict. However, leadership and team management can be areas in which residents whose fund of knowledge and clinical skills are strong struggle, and even residents whose leadership skills are strong often desire to further their development in this arena.

The Social Purposes of Medicine and the Future of the Profession

Residency training is relentlessly focused on the concrete and the present. Of course, GME would be failing the trainees as well as their current and future patients if there were not an unshakable commitment to ensuring that residents

complete their training capable of providing high-quality care for the patients they see. However, as one member of our team observed about a top-tier university training program, "learning the skills of the trade so dominates that there is no time to consider the profession and where it is going." This is a time of enormous change and great possibility for medicine in the United States. Residents are the postdoctoral fellows and the future of the profession; as they develop advanced knowledge and skills in their specialty, they should also be grappling with what Bereiter and Scardamalia (1993) call the "constitutive problems of the field." Making them so busy that they are disinclined or incapable of doing so is an educational failure.

A Clearly Defined Core

Just as in medical school, selection and sequencing of clinical rotations for residents is a key curricular decision. However, although all residency programs have learning objectives for every resident rotation, a system for assessing whether residents have actually met those objectives is commonly lacking. A related curricular challenge has been inadequate definition of core content as a platform for lifelong learning in an ever-changing field. Instead, an anxious desire to include everything has led, and continues to lead, to an ever-lengthening duration of training. Given the dramatic increase in busyness of clinical settings, both inpatient and outpatient, and the proliferation of things to be learned, how does a residency program (or at the level of board certification, a specialty board) make it all fit? From an educational perspective, it is important that residencies commit to an appropriate core in order that residents see a sufficient number of examples and variants to develop elaborated conceptual frameworks and to practice psychomotor and other skills. Finally, we see inculcation of the values of medicine as one of the critical goals of medical teaching. Serious attention must be accorded the hidden curriculum because it is at least as important a force for learning as the formal curriculum, and it often works against what the residents' educational program states it is trying to teach (Hundert, Hafferty, & Christakis, 1996).

Efficiency and Individualization of Progress

Any careful review uncovers these and a number of other opportunities to improve residency education (diFrancesco, Pistoria, Auerbach, Nardino, & Holmboe, 2005). We are not suggesting, however, adding time to the residency period. We are suggesting instead that the efficiency of residency education be improved so that

learners—and their patients—are guaranteed that a three-to-five-year training program offers the experience to prepare graduating residents to competently care for the majority of patients whose conditions fall within their specialty, the skills to enlist assistance when needed, and the discernment to identify those situations in which help is needed. Clearly, graduate medical education must arm residents with insight, humility, and deep commitment to patients to ensure this.

We are confident that there is time within the current envelope of residency training across the specialties to educate residents both more broadly and more deeply. Educational inefficiency is always problematic, but it cannot be tolerated at a time when the medical knowledge base is burgeoning, attending physicians are raising concerns that their residency graduates may not be ready for independent practice, educational debt is perverting career choice among young doctors, and physician-scientists are in their early forties before they achieve independent grant funding. It is thus imperative that residents have clinical responsibilities that support their learning rather than assignments that meet the needs of the medical center or hospital hosting their training. Further, residency training must become significantly more flexible so that programs are both efficient and individualized.

In many programs, residents, especially at the more junior levels, spend significant time doing clerical work. Eliminating time spent on clerical activities (Boex & Leahy, 2003) and allowing residents to move on to more challenging learning issues once they have achieved an acceptable level of performance for their stage in training (Long, 2000) would yield time to tackle new domains and higher levels of achievement. Elimination or minimization of this nonphysician work, combined with competency-based assessment and individualization of progress through residency experiences, holds the promise of freeing resident time and allowing significantly more substantive education to occur within the current time envelope of residency across specialties.

Residency programs require the ability to construct curricula that meet the needs of trainees in the field in general and of individual residents. Good-faith selection of clinical settings and experiences for GME trainees should be determined by what residents need to learn, not where medical centers need clinical labor. The clinical experiences of residents, their rotations, must be selected on the basis of what independent practitioners in that specialty should be capable of handling, not units that the medical center wants covered. This inevitably means that not every patient admitted to a teaching hospital will be cared for by a resident team. Furthermore,

in nearly all specialties much more resident education should occur in outpatient settings, as fresh graduates across the specialties must be capable of working effectively in these environments and to diagnose and treat the conditions seen there. Similarly, for the benefit of both residents and medical students, new formats and venues, both clinical and nonclinical, should be developed, allowing residents to work with medical students outside the traditional inpatient disciplinary clerkship.

Moreover, residency education must develop mechanisms for providing alternative rotations, or, for residents who have achieved the basic objectives of a particular rotation, doing the assigned block at a more advanced level. Faculty members and program directors in particular have considerable difficulty in envisioning how such individualization of residency training might be accomplished. Of course, it would not be practical to allow a supervising resident to depart a clinical placement, leaving behind her intern and students, the day she demonstrates that she has met the core competency requirements of that rotation. However, residency training currently affords insufficient opportunity for mentored resident participation in activities representing the inquiry, innovation, and improvement activities of physicians. One option would be to more closely connect or integrate innovation, improvement, and inquiry activities to the residents' clinical settings, rather than treating them as entirely different (an issue we explore in greater depth in Chapter Seven). Improvement in pedagogy would also foster greater individualization. Anxious clinical teachers who dictate management strategies retard acquisition of critical competence, especially in more advanced learners. Teachers must become skilled at assessing resident capabilities and in constructing a space for learning in which the resident is acquiring new knowledge and skills and practicing recently acquired ones. A resident educational program that allows motivated and capable learners to proceed at their own pace and engage the constitutive problems of the field will require commitment to the core obligatory competencies and the means to verify that residents have achieved them.

A Commitment to Excellence

Perhaps most disturbing is the simple persistence of the recognized problems with GME. Given that little of what we have identified constitutes novel insight, we infer that there is inadequate commitment to correcting the deficits in residency education. The reasons for this are evident. Residency education is, at its heart, experiential learning; residents learn about the clinical work in which they participate. There are significant vested interests that control the choices about

the clinical settings in which residents find themselves. Thus the current stresses in the health care system threaten many of the positive attributes we observed. We are especially concerned about the limited time that faculty members are able to commit to teaching, because of the increasing pressures of the medical marketplace. Thoughtful teaching takes time, as Ludmerer has so compellingly observed (Ludmerer, 1999, 2000). It is critical that faculty members with an inclination and aptitude for teaching not be forced to choose between preparing the next generation of physicians and activities that support their practice and their family. As we discuss in Chapter Five, too often the income stream associated with GME is captured by the hospital and does not make its way to the clinicians who are actually teaching. In addition, as has been repeatedly observed, the structure of IME and DME locks the residents into inpatient training (Iglehart, 2008; Rich et al., 2002). The sustained connection with faculty members that is so important to effective resident education is not possible without significant reorganization of the financing of medical education; accordingly, the recommendations that we propose in Chapter Eight address some of the disincentives to change.

DISCUSSION HIGHLIGHTS

DAY 1

THE GME CONTEXT AND CONFERENCE GOALS

MODERATORS » GEORGE E. THIBAULT, MD, AND DEBRA F. WEINSTEIN, MD

Dr. Thibault explained that this was the second of two conferences on GME reform sponsored by the Josiah Macy Jr. Foundation and reviewed the conclusions and recommendations from the first conference, which focused on finance and regulation (*Ensuring an Effective Physician Workforce for America: Recommendations for an Accountable GME System*, October 2010).

Conclusions:

1. GME is a public good.
2. Because GME is a public good and is significantly financed with public dollars, it must be accountable to the needs of the public.
3. There is an urgent need to assure the training of an adequate number of physicians.
4. There is a need for an independent review of the GME system.

Recommendations:

1. An independent external review of the goals, governance, and financing of the GME system should be undertaken by the Institute of Medicine or by a similar body.
2. Accreditation policies should enable GME redesign.
3. The funding of GME should be reexamined to assure there will be an adequate number of physicians.
4. Mechanisms should be established to fund innovations in GME.
5. An immediate increase of 3,000 entry-level positions in targeted core residencies should occur, with subsequent changes based on accurate workforce assessments.

Dr. Thibault asked participants to use these conclusions and recommendations as a platform to examine the structure, content, and pedagogy of GME with the goal of coming to a consensus on conclusions and recommendations to move GME in the right direction.

Dr. Weinstein provided an overview of the conference process, which was primarily comprised of breakout groups to examine questions focused on key problems and opportunities in GME and discussions among the larger group.

BRIEF SUMMARIES OF THE COMMISSIONED PAPERS AND THE CANADIAN GME PLANNING EFFORT

THE HISTORY OF CALLS FOR REFORM IN GME AND WHY THEY HAVE FAILED

SPEAKER » KENNETH M. LUDMERER, MD

Dr. Ludmerer looked at prior attempts at GME reform and why they did not work. He noted that the problems in GME are complex and deep but solvable, and that GME leaders and faculty have the intellect and the heart to solve these problems.

Discussion

COMMENT: If sociocultural learning theories are important—and I believe they are—and if we are here to serve the public, where is the public at meetings like this? How do we know what the public wants?

COMMENT: There are coalitions or consortiums that would be worth sharing the report with and getting feedback from, such as the Campaign for Better Care, or a group of consumer advocates such as AARP, Consumer Union, or Consumer Checkbook.

COMMENT: There are a lot of linkages in what you're talking about here, from the hidden curriculum to how our students are not getting exposed properly and then becoming jaded and cynical as they go through all of their training.

THEORY AND PRACTICE IN THE DESIGN AND CONDUCT OF GME

SPEAKER » BRIAN DAVID HODGES, MD, PHD, FRCPC

Dr. Hodges provided a high-level sociocultural view of the literature on GME, highlighting current practices, why things that should change don't, how the literature supports or does not support current practices, and how the literature can be used to grapple with problems in the design and conduct of GME.

Discussion

COMMENT: This whole area around the hidden curriculum, we've got sort of a vicious cycle that occurs. I'm wondering if the way to break that vicious cycle is to separate the education of our medical students from our residents. Students now spend all of their time with a resident under a different set of stresses rather than with the teaching faculty, where they might see a better example of what medicine is.

COMMENT: I'm not sure about separating or removing them from each other, but the transitional moments are extremely important and extremely risky. . . . On Thursday, I was a medical student and on Monday I was doing my internship and responsible for more patients than I could count, without much preparation. . . . Could we do some sort of inoculation model where we say to the medical students, "You're going to go into an environment which is going to challenge your ethical and even moral values at times. You're going to see role models who are not helpful and you're going to need to have some psychological and other strategies to imagine how you would deal with that environment."

COMMENT: I'm just wondering, rather than the immunizing of students against that toxic environment, if the better solution isn't joining of those silos and removing the toxins to create a much better environment.

CANADIAN PLANNING EFFORT

SPEAKER » NICHOLAS BUSING, MD

Dr. Busing described the Canadian review of GME, which is funded by the federal government and led by a steering committee comprised of program directors,

deans, students, residents, accreditors, certifiers, and regulators. The review involves a detailed consultation and engagement process with stakeholders (including surveys of program directors and the public), a comprehensive environmental scan, and international consultations, including with people involved in GME in the United States. The intention of the review is to bring opinions and evidence from the literature together to develop recommendations for GME change in Canada.

Discussion

COMMENT: Almost 70% of hospitals in this country [the United States] are hiring practices and buying hospitals. We're basically producing a monopolistic system that's going to be different before the Senate Finance Committee ever starts funding any of the current bill that's set to go into motion in 2014. . . .We're going to have a whole new system to work with that is just starting to be developed right now. . . .Small practices are closing in specialty areas like surgery. . . . They're all joining these big systems. That's the system that we have to accommodate our graduates for.

COMMENT: There needs to be more of a seamless stream from the undergraduate to the graduate, so much so that one might argue that as we're reforming GME we need to consider whether there is underutilized time at the end of medical school.

MODERATOR » TIMOTHY C. FLYNN, MD

Plenary Session

Dr. Flynn set the stage for breakout group discussions about the GME curriculum and training sites. He noted that GME experiences vary and that what constitutes the essential learning needed to turn a student into a medical professional is unknown. The competencies tend to be put into boxes that are checked off after completion of a course. Training is fragmented, determined by the hospital's service needs and patient population, and influenced by the high value placed on subspecialty care. Dr. Flynn challenged the breakout groups to develop concrete responses to two sets of questions.

Questions on curriculum (Groups 1 to 3):

- Q» *Can we use the ACGME-defined core competencies as the foundation for curriculum development, or are any significant additions or changes needed in the desired outcomes of training?*
- Q» *Which topics and skills must be addressed in the training of all physicians (i.e., what is the "core" GME curriculum across all specialties)? How should this inter-specialty education be accomplished?*

Questions on sites of training (Groups 4 to 6):

- Q» *What sites of training should be included to ensure effective delivery of the curriculum, and how should this be accomplished?*
- Q» *How should the proportion of training in various settings of care be determined?*
- Q» *What are the approaches through which inter-professional training should be undertaken?*

Discussion

COMMENT: People come out knowing pretty much what they need to know about taking care of the patients. It's all the other things—such as systems-based learning and cost containment—that we don't know how to teach well. Unless we get some sense of what the best practices are and where they are—maybe they're outside of medicine—we're just checking off boxes in ways that are not meaningful.

COMMENT: Unless we move to more shared resources across disciplines, we're really not going to be able to move GME forward. Siloed learning is very, very detrimental.

COMMENT: The whole competency project has failed because people didn't accept it as important. The ACGME, through its RRCs, has not enforced its own recommendations regarding the competencies. That is why we haven't seen as much of a push, because we haven't enforced what we said was important and should be done.

COMMENT: Rather than try to segregate those two areas [service and education] we need to bridge them. If our service obligations are society's way of articulating its demand for the kind of medical care that's necessary, we ought to capitalize on that rather than try to segregate ourselves and residents from it.

COMMENT: We need to honor the service/education tension, not try somehow to make it a total dichotomy.

COMMENT: If you don't identify ways to preserve time for curriculum-driven activity, then the learning will be around whatever kinds of patients walk through the door of a particular institution.

COMMENT: If one concedes that the assumption of responsibility is the guiding educational principle of residency, then by definition there is significant service to be done.

REPORTS FROM BREAKOUT GROUPS: DISCUSSION HIGHLIGHTS AND KEY POINTS

Groups 1 to 3: GME curriculum

GROUP 1

COMMENT: The problem isn't the competencies themselves, but the acculturation of the competencies throughout training in the curriculum.

Key points:

- Needs related to the competencies:
  - Good ways to measure the competencies; and
  - A common language to define the competencies.
- Suggested additions to the competencies:
  - Collaboration, including teaching teamwork and leadership.
- Focus on meaningful inter-specialty education, rather than simply bringing residents from different disciplines together to teach them about topics such as ethics and the business side of medicine in order to check off professionalism or system-based practice. Examples:
  - Bring residents from different specialties together to discuss cases, and how the different specialists could have collaborated better.
  - Require a seminal inter-disciplinary quality improvement project.

GROUP 2

COMMENT: We gave them [the current competencies] a grade of good. . .to some degree we know how to teach them. . . .We have much less utility in how to assess them.

Key points:

- Needs related to the competencies:
  - Specific clinical learning activities to help define the competencies;
  - Outcomes-based competencies with clear accountability; and
  - Organization of service work to emphasize the clinical activities instead of trying to separate service and education.
- Suggested additions to the competencies:
  - Teamwork (important enough to be a separate competency)

GROUP 3

COMMENT: The competencies now seem more like six lines on a piece of paper that don't interrelate very well. If we present it in a different way it may catch on a little bit better.

Key points:

- Needs related to the competencies:
  - Evaluation as part of a true assessment process
- Suggested additions to the competencies:
  - Personal accountability;
  - How to be a team member/manager;
  - Social responsibility; and
  - Managing complexity and ambiguity.
- Other suggestions:
  - Use the fourth year of medical school (a "wasteland") for more inter-disciplinary and inter-professional learning so that students appreciate other professions and learn how to care for patients together.

Discussion

COMMENT: When I talk to program directors and I ask them to name the competencies, they can't do it, even after five years. I see this as a serious barrier to the work of advancing medical education.

COMMENT: It was a great service to develop these six competencies and provide a framework for curriculum development. But now that we've had some experience and realize that the terms are not easily taught or understood, is it appropriate to reframe this?

COMMENT: Should we really be looking more at behaviors and how you actually do something rather than, check this box, check that box?

COMMENT: There is a lot of work not happening to take those abstractions and turn them into something that's concrete and pragmatic through the development of milestones, and things called "entrustable" professional activities.

COMMENT: We need to integrate those six competencies in the most ideal situation with each patient encounter and have them patient centered.

COMMENT: It's really important to be thinking about these things [the competencies] as frameworks for conceptualizing practice, rather than necessarily the activities that define what it is to be a good physician.

COMMENT: The genome of GME is well preserved and very difficult to break. How we were trained is how we teach.

COMMENT: What program directors did when they saw the competencies is develop a lecture on this, a short course on that. . . .We need to focus in an integrated way on the patient encounter.

COMMENT: The competencies are a wonderful way of framing who we are as physicians. But we have to get faculty involved with learning about what they are and how they're defined.

Groups 4 to 6: Sites of training

GROUP 4

COMMENT: Sites of training might be organized around the trajectory of the patient within the discipline to reflect their episode of care. There may be some value in going to sites that normally we haven't gone to. As an example, as an internist, maybe I should spend more time in a nursing home or a rehabilitation center.

Key points:

- Site selection and training in various settings:
  - There is an important connection between site and curriculum, driven by the needs of the public.
  - All sites should have good clinical outcomes, competent faculty, and a competent learning environment.
- Inter-professional training:
  - Residents should work on a quality or safety project embedded within a team that includes other professionals.
  - Use simulation.

GROUP 5

COMMENT: A curriculum needs to be defined in a model prior to sitting down and selecting sites. Inherent in site selection ought to be the principle that however we allocate and distribute time and resources as far as resident work hours, each site needs to have a high educational margin.

Key points:

- Site selection and training in various settings:
  - The main challenge is how to embed the curriculum and ensure a high educational margin at each site.
  - One size does not fit all: What ought to occur at those sites depends on individual or specialty career paths.
- Inter-professional training:
  - There should be two types of inter-professional training:
    - Direct modeling in the patient care context: promoting a patient-centered, team-based care model within—and outside—the hospital; and
    - Leadership education to teach residents how to work with, and in certain situations, supervise, other providers.

GROUP 6

COMMENT: The teaching hospital has, in some settings, separated trainees, which we thought ought to be rectified.

Key points:

- Site selection and training in various settings:
  - Train residents in tasks and functions.
  - Provide opportunities for career individualization.
  - Teach residents how to be part of and lead a team.
  - The community setting may be better for some training.
- Inter-professional training:
  - Intermix trainees from different diseases and disciplines (e.g., nursing) to the degree possible.
  - Include acculturation and communication so residents learn how to be good communicators and develop respect for coworkers.
  - Inter-professional training might be done more effectively in community-based practices rather than in teaching hospitals.

LENGTH AND FORMAT OF TRAINING PLENARY SESSION

MODERATOR » MICHAEL M. E. JOHNS, MD

Dr. Johns set the stage for the breakout group discussions about the length and format of GME training. He noted that the right length and format of training is unknown, there may be better ways to integrate all training (e.g., medical school, residency, and subspecialty training), and the endpoint of training and its measurement should be reconsidered. Dr. Johns challenged participants to consider the best way to educate residents for what they will be doing in practice.

Questions on the length/endpoint of GME (Groups 1 and 2):

Q » *Should the length of training be tied to individual achievement of competency rather than a fixed duration?*

- *If yes, how could this be structured?*
- *What would need to be in place for this to be implemented (e.g., process to establish competency metrics and for assessing competency)?*
- *If no, should the duration of required training in various specialties be reconsidered, and how should the "right" duration be determined?*

Questions on sequence/tracking (Groups 3 and 4):

Q» *In light of the continued trend toward subspecialization in care delivery, should trainees who plan to subspecialize progress to subspecialty training more rapidly or more directly?*

Q» *Should the goals, objectives, and experiences of training—and perhaps the areas in which certification is available—be more sharply focused on the planned eventual scope of practice (i.e., aligning education with eventual practice)?*

Q» *Should pipeline programs (e.g., medicine and pediatrics) be reduced by one year with an expectation that all residents do fellowships (including in primary care)?*

Questions on flexibility and opportunities to individualize training (Groups 5 and 6):

Q» *Is there sufficient flexibility for individualization at the level of the program (in terms of the types of careers they train for) and/or for each trainee?*
For example:

- *Should there be programs or tracks geared toward different settings/types of practice within a given specialty (e.g., community-based versus tertiary), or for different types of careers (e.g., physician-scientist, global health, or clinical educator)?*
- *Should there be opportunities for part-time residency training?*

Q» *Should GME programs all train for the same purpose (e.g., excellence in clinical care), or should programs define individual goals, such as training physicians who will practice in the region, training physician-scientists, etc.?*

Q» *Should there be training opportunities for reentry into clinical medicine or changing/expanding scope of practice in mid- or late career?*

- *If yes, how could this be structured?*
- *What would need to be in place for this to be implemented?*

Discussion

COMMENT: Even with an indefinite length of educational time, a person is not necessarily going to be exposed to everything. Even if we knew what someone might be exposed to tomorrow, we don't know what the issues will be the day after tomorrow or the week after that.

COMMENT: This is really threatening to people's identity, what it means to be within their specialty. For many people, the idea that we would change the system is about their loss of identity, if they've been doing this for a long time.

COMMENT: We have evidence that goes back a long way that you can shorten training and it's okay. We just keep ignoring it. That's been true in family medicine. These accelerated pathways work; if you pick the right people to go into them, they do just fine.

COMMENT: What we mean by "done" is an underlying and quite intense anxiety of GME educators.

COMMENT: The surgeons in my institution are saying that with the duty hour limitations and the procedural requirements, many of their graduates don't feel ready to go out into practice. That has to do with the proliferation of almost everybody taking a fellowship these days. We're talking about shortening. We also have to think about changing the requirements to be "done." What does "done" mean? What do people feel they are capable of doing at the end of each of these artificially set-up time periods?

COMMENT: It's good to be a little bit fearful about going out into practice. You would expect people to be a little bit cautious because you aren't a finished product at that time.

COMMENT: The financial implications for residents who are trying to plan their lives and also for program directors and hospitals in terms of scheduling service need to be considered. The logistics are going to be very challenging.

COMMENT: We have hidden under the euphemism of greater responsibility the fact that the first and second year of residency, and I'll speak for the surgical specialties, is a wasteland of ridiculous activity. Our residents are starting to learn surgery in their third or fourth year. These are the brightest kids on the planet, and at age 24 they should easily be able to take out your colon. They can't take out your colon now until they're 30. That's a problem that we have to address.

REPORTS FROM BREAKOUT GROUPS: DISCUSSION HIGHLIGHTS AND KEY POINTS

Groups 1 and 2: Length and endpoint of GME

GROUP 1

COMMENT: We're just not designed to be very efficient. Therefore, we add time and requirements that probably don't add significantly to the experience of the trainee and probably doesn't serve the needs of society. . . .Shortening training meets the needs of the trainees and the patients as well as overall societal needs.

Key points:

- Tying the length of training to competency makes sense but requires that competency be defined.
- Define competency with an assessment process and a knowledge-based exam.
- Give residents a lot of feedback quickly during training:
  - Simulation is a good way to do this and could reduce the amount of training needed.
- Develop core training, for example, two years of general surgery plus additional specialty training.

- In fields such as internal medicine, two years or core training should be sufficient, with the option of additional specialty training in internal medicine, etc.
- If the preliminary year is required, it must add value to the resident's training.
- Use modular training to provide in-depth understanding of a subject and continuity. For example, training in hernias would place residents in a clinic that focuses on hernias and allow them to perform many hernia surgeries.

Discussion

COMMENT: Preliminary year is a bit of a problem because an awful lot of people disappear after that and it's all that is required for licensure in all 50 states now. Nobody tracks those people after that.

COMMENT: RRCs are very specifically looking at how you track your prelims. So if you have a track record of bringing in prelims and you do not place them, either in surgery or into other specialties, you will absolutely receive a citation.

COMMENT: There is some value for those prelims who have the opportunity to do a year and then say, "This really isn't right for me," and then they go in another direction entirely.

GROUP 2

COMMENT: If very clear goals are set and national metrics are met, training should be competency based as opposed to time based. There should be a minimum of three years or 36 months of training for all specialties. . . .The third year could either be to start your subspecialty or if you're not going to subspecialize, that third year would be to give a chance for maturation of clinical decision making and judgment so you felt more confident.

Key points:

- Offer an enriched experience within the last year or the last six months that's customized for individual residents; this will meet the needs of the individual and the public:
  - This requires giving clinical competency committees or program directors tools, based on national metrics, for frequent monitoring of the enriched experience.

- Develop safeguards for residents and program directors and institutions against abuse and/or misuse of competency-based training due to personal conflicts between clinical competency committees or program directors and individual residents.
- Competency-based measurement will be more challenging for larger resident programs.
- Develop clear guidelines and documentation for promotion of residents. Base these on measurement tools and notify applicants and residents about guidelines and required documentation upfront.
- It is likely that few residents would qualify for the shortened training period. Some residents would require extra training.

Discussion

COMMENT: If we have significantly shorter lengths of training to go into generalist fields, what does this do to the stature of generalism relative to specialty fields? Will it continue to attract people or does it have the consequence of saying, "Well, it's not as hard, it doesn't take as long, I'm not going to be a primary care physician. I'm going to go into a subspecialty"?

COMMENT: It's a very complicated question. It really depends on what a generalist actually does. That very much dictates the model.

COMMENT: There should be a way to devise a competency assessment system via national metrics by virtue of objective points that are reached, but also via a more local assessment that incorporates the intangibles: maturity of thought and judgment.
And incorporate that into an assessment of competency that allows for variable length of training.

Groups 3 and 4: Sequence and tracking

GROUP 3

COMMENT: Preliminarily, our answer is yes to all of those questions. There are a lot of things that could be pruned from standard training, but at the same time, there are a lot of opportunities or needs for improvement that would make this feasible and doable.

Key points:

- See what could be eliminated, or done earlier or later, and how to modify systems to increase effectiveness without sacrificing quality.
- Skill maturation is critical; encourage deeper involvement in decision making early and observe residents until they develop a mature mastery of the skills necessary for their field.
- For primary care training, provide training in specific primary care environments, such as rural locations.
- Develop a system for incorporating activities and learning that facilitates the development of judgment and cognitive skills.
- Well-executed, efficient, and individualized education will be very expensive. Existing and past pilot projects can be informative; future pilot projects should be encouraged.

Discussion

COMMENT: There are potential implications for patient safety as we shorten training. If we were going to do this, we would have to ramp up our supervision and mentorship and the long-term relationship between the residents and their mentors.

COMMENT: A critical issue is the fragmented nature of resident-teacher interactions. If we're actually going to certify people to leave sooner, that becomes an even more critical issue. . . .In my time as a program director, the single most important thing I did was know my residents. . . . How do we give advice and assurance that people have actually been meaningfully evaluated, gotten meaningful feedback, mentoring, and guidance?

COMMENT: An additional issue that will have to be faced if we really individualize training and time length is the fact that the residents often learn a lot from each other. There's a sense of identity, a sense of class, getting through it together, learning from each other's experience.

GROUP 4

COMMENT: It is possible and desirable for a number of reasons to speed up the process of training. A number of changes would need to occur [to do this], including in medical school.

Key points:

- There are many advantages to training that is more sharply focused on the planned scope of practice, e.g., specialized training for rural physicians.
- If training is focused more sharply, consider whether individuals should be able to learn particular skills post-residency and be certified.
- There are two models for pipeline programs:
  - Students could choose a specialty in medical school and go into a residency in that specialty. Surgeons were more comfortable with this model than internists.
  - Residents could take two years of generalist training and then go into the specialty.

Discussion

COMMENT: There was a program that ran into the early 1990s that was handled by exception where people could short track into the subspecialties after two years. One third of my class at Yale did exactly that.

COMMENT: We have looked at how those people ended up doing; they did just fine. Their exams scores were no different. They went on to quite successful careers.

Groups 5 and 6: Flexibility and opportunities to individualize training

GROUP 5

COMMENT: There may be a desirability in establishing a minimum floor of experience, so that a given trainee would be exposed to at least some of all areas and then he or she could differentiate and expand and grow in more desired areas of focus.

Key Points:

- Flexibility for individualization:
  - Some specialties have more opportunity for elective time than others.
  - Use the fourth year of medical school for individualization; for example, some surgical specialties have instituted "boot camp" experiences during the fourth year.

- Training for the same purpose or individual goals:
  - It would be beneficial to help individual trainees train for their goals.
  - Different training environments offer valuable experiences.
- Training for re-entry or changing/expanding practice:
  - Some of this is already happening as some trainees take time for family expansions. Policies about parenting leave and making up the time differ.
- Other:
  - As medicine and the skill set required for it changes, having a long-term commitment to graduates will become important.

Discussion

COMMENT: Maybe we should think of setting up a separate pathway for that group of people [people who took time off and want to reenter residency] and charge some institutions to do that kind of retraining. The educational needs and the educational infrastructure and technology needed to take a guy who's 48 years old and was building houses is different than that of a 22-year-old who just graduated.

GROUP 6

COMMENT: All of these suggestions give me concern about how complicated we're going to make the lives of program directors and how we're going to retain them.

COMMENT: I was trained as a pediatrician for two years and at that point in time, you could choose to do a fellowship, a chief residency, or a one-year focused outpatient curriculum. Maybe we need to look back at what we did in the past.

Key points:

- All answers are predicated on defining a set of national core competencies used to assess that a resident is competent to practice independently. The core competencies must have robust formative and summative evaluations.
- Flexibility for individualization:
  - With agreed-upon core competencies and outcome measures, it's quite possible to start with focused training, integrate the core competencies, and track individuals based on achieving those competencies.
  - There are multiple barriers to offering focused training earlier: service needs,

the way GME is financed and configured, and market forces, including the regulatory bodies for GME.

- Training for the same purpose or individual goals:
  - Train residents to provide excellent clinical care, integrating the core competencies with the flexibility to train toward the core desires of individuals.
- Training for reentry or changing/expanding practice:
- GME should allow part-time residency in order to meet the needs of trainees.
  - Two types of reentry:
    - Coming back to refine skills
    - Coming back to change specialties
  - Consider creating a specialized course based on self-pay. Whether this should be fully integrated into the GME system is unclear.

Discussion

COMMENT: When you have these multiple tracks, what does the board certification certify? The boards have a description of what it means, for example, to be a pediatrician and that's got a list of things. If you're only going to do one third of the things, what does that mean?

COMMENT: Can we do all of the things nationally recognized and defined by better appropriating the tasks that we do and minimizing the waste?

COMMENT: There could be different approaches or vehicles to getting that core competency accomplished. For instance, in pediatric training, somebody who wants to do rural health might rotate in those kinds of clinical settings and somebody else might stay at an academic medical center or might go to Africa. Everybody's building toward that same list, but doing different kinds of activities depending on their eventual career goals.

COMMENT: For every three years of slots saved, you had another position for somebody in primary care. If you could gather 3,000 saved slots you have 1,000 positions that could go through and be added where society needs them.

DAY 2

TRANSITIONS BETWEEN PHASES OF MEDICAL EDUCATION AND GME PROGRAM QUALITY AND OUTCOMES

MODERATORS » DAVID P. SKLAR, MD, AND KATHRYN M. ANDOLSEK, MD, MPH

Plenary Session

Drs. Sklar and Andolsek set the stage for breakout group discussions about phases of medical education and GME program quality and outcomes by highlighting current status and issues, the literature, ACGME requirements, and more. Dr. Andolsek noted that the transitions to be discussed were primarily those from medical school to residency and from residency to independent practice. Dr. Sklar noted that not enough is known about GME program quality and outcomes, and that there were many issues to be discussed, including defining what quality means.

Questions on transitions between phases of medical education (Groups 1 to 3):

- Q» *Are transitional year and preliminary programs providing useful and appropriate training?*
- Q» *Can medical school be shortened, such as by merging the 4th year into residency training?*
- Q» *Should "junior attending" positions be created, with independent billing but with access to supervision?*

Questions on GME program quality and outcomes (Groups 4 to 6):

- Q» *How should GME program quality be assessed?*
- Q» *What research is needed and how can it be accomplished?*
- Q» *How should each program respond to its responsibility to meet societal need?*
- Q» *What system of oversight and regulation would ensure highest quality GME?*

Discussion

COMMENT: In the questions about transitions, we have to get broader about what's the end of training. At least where I live, so many people go into fellowships and I can't tell whether it's to add more flavor to the Jell-O or just prolong the gelling process.

COMMENT: I've seen who determines what our GME residents will be learning largely reflect where society wants people to go.

COMMENT: One of the transitions it's important for us to think about is from medical school to residency. Nobody should be advanced to a training program until they have demonstrated a level of competence so that we don't have to do so much rework in the early part of residency.

COMMENT: In Canada, all residency training programs are in the university. There's always a proximity of the undergraduate and postgraduate dean and a close collaboration between institutions.

COMMENT: As part of the ACGME milestone project, all specialties will be charged with developing a road map. They have bracketed the residency transition on the front end by saying, what does the graduating medical student who's going to come into your field need to know? Then on the other end by saying, what does the practicing physician look like in this area of competency? If this milestone project does what it could do, it will try to bridge that entering skill set and then practice skills.

COMMENT: The MedPAC report about potentially putting some finances at risk and then giving that money back to the hospital based on educational performance, what happens when you have those inner-city residency programs and hospitals that, because of lack of infrastructure, etc., won't be able to hit these targets? The low will get lower potentially.

REPORTS FROM BREAKOUT GROUPS: DISCUSSION HIGHLIGHTS AND KEY POINTS

Groups 1 to 3: Transitions between phases of medical education

GROUP 1

Key points:

- Transitional year and preliminary programs:
  - Phase out the preliminary and transitional year, being sensitive to people who don't match in their area.
  - Counsel medical students so that they understand that they may not be able to pursue their first choice.
  - Create a national workforce commission to provide information to be used to better counsel students.
- Shortening medical school:
  - Combine some standardization with flexibility for individualization in the fourth year Limit the number of clinical specialty tryout rotations to three months, which many schools already do
  - Use performance on outcomes-based exams or measures that are relevant to the competencies to determine whether a student can leave medical school early or expand his or her academic scholarship during the fourth year.
- "Junior attending" positions:
  - It's very important to enhance and strengthen the final year of training to facilitate independence. This requires faculty development and supervision
  - Develop an option for residents who aren't doing a fellowship but would like one more year of training from supervised to independent practice.

GROUP 2

Key points:

- Transitional year and preliminary programs:
  - Perhaps the first year of training should focus on the specialty.
  - The transitional year may not be necessary, as few people choose to do this.
  - There is a need for robust experiments that allow creativity, followed by analysis of the results.

    - After match day, have a boot camp or a set of rotations, perhaps one arm for the procedure-based specialties and another arm for other specialties. Program directors should collectively determine what residents should know before starting their residency
- Shortening medical school:
    - Yes, medical school can be shortened.
    - The fourth year could be used to provide a more valuable experience for entering internship.
    - Basic science could be compressed, after considering which parts of the curriculum are most valuable and eliminating less valuable parts of the curriculum.
- "Junior attending" positions:
    - Some fellowships do this now.
    - GME programs should not abdicate their responsibility for delivering a product that is proficient; however, the transition from proficient to expert takes place over the first years of practice. There should be a graded increase in responsibility over the course of residency.

Discussion

COMMENT: There has been a great proliferation of non-ACGME approved fellowships. One incentive is that you can call these people junior faculty and bill for them. I'm wondering whether we shouldn't recommend that the ACGME allow billing in the primary specialty.

GROUP 3

COMMENT: We didn't have a lot of data in large-scale studies that could answer the questions for us. . . .We clearly see a need for further articulation of milestones of what's expected before and after the transitions.

Key points:

- Transitional year and preliminary programs:
- There is utility for the individuals served in these programs, but it is not enough to meet societal good.
- Any changes need to make provisions for students who either don't match or aren't sure what they want to do, whether this is a undesignated preliminary year or a transitional year.

- Some programs, such as the U.S. Navy, use a transitional program.
- The transitional or preliminary year should be done in the same hospital as the residency program to provide continuity.
- Shortening medical school:
- Medical school can be shortened to three years, which could provide a one-time bolus of 16,000 to 17,000 graduates going into the system and decrease debt for medical students. However:
- This would not be a major societal good.
- Many medical students need the fourth year to finish their training.
- The fourth year allows time for decompression and stress relief.
- Once a student knows his/her specialty and has been matched, the specialty could take a role in preparing the student (e.g., surgical boot camps).
- "Junior attending" positions:
- Develop a structural way to allow finishing residents or fellows to function independently so that program directors can say whether a resident or fellow can function independently. This is a clear societal need.
- Milestones and assessments must be developed that can be used to demonstrate that a resident is ready to function as a member of the junior staff during the last six months or so of training.

Discussion

COMMENT: In Canada, McMaster and Calgary have always had a three-year curriculum. Analysis of student success in all disciplines is similar to the four-year schools.

Groups 4 to 6: GME program quality and outcomes

GROUP 4

COMMENT: There needs to be a bit of a change of focus in institutional and programmatic accreditation. Often times, what's looked at is board passage as well as a whole series of check-offs that focus on process variables.

Key points:

- Assure that institutional culture reflects continuous quality improvement.
- Make quality of care part of the accreditation process.
- Examine patient care outcomes of graduates.

- Develop robust workplace assessment of residents and graduates.
- Engage Medicare about:
  - Allowing residents to provide some billable services (e.g., senior residents can perform a surgical procedure without supervision).
  - Creating "education innovation zones" allowing educational innovations to be created and rigorously studied; a national coordinating body would help develop assessment tools and studies.
  - Funding models that facilitate innovation.
- Oversight and regulation:
  - GME programs should be scored rather than pass/fail. Develop quality metrics for programs and post them on the Web, as many health systems are now doing.
  - Encourage the ACGME to have uniform standards for supervision across disciplines, evidence-based standards around procedures, and so forth.

GROUP 5

COMMENT: It's hard to figure out how GME program quality should be assessed when you don't know what the outcome is that everyone is looking for.

Key points:

- Assessing GME program quality:
  - ACGME should integrate outcome targets into a single defined set of competency-based goals. The competencies must be translated into the language of day-to-day practice.
  - A more precise definition is necessary for noncognitive skills.
- Research needs:
  - Standardization of the behavioral tool set, with an emphasis on advanced leadership and team skills
  - Patient outcomes as a measure of program quality
  - Precise outcome measures and how process measures are related to outcomes
- Responsibility to meet societal need:
  - Addressing community and societal needs to determine what to train residents for requires a partnership
- Oversight and regulation:
  - Oversight and the responsibilities of the RRCs should remain with the ACGME, but there are many opportunities for improvement.

- Involve RRCs with their respective professional societies.
- Appoint members of the public to the RRCs.
- Blind program information forms to eliminate all possible conflict of interests.

GROUP 6

Key points:

- Assessing GME program quality:
  - Develop balanced report cards using local data and national information (e.g., resident surveys). Apply the report cards regularly to each residency program.
  - Track residents into practice to measure patient outcomes.
- Research needs:
  - The amount of time needed to achieve competence: Compare the old and new rules and study issues such as satisfaction, safety, and competence
  - The impact of modular versus traditional training
  - Ways to streamline training by focusing it and allowing or encouraging early decisions among trainees; developing cognitive skills and matching trainees into both medical school and residency at the same time in order to encourage those early decisions
  - A pilot study of the impact on career choices when the salaries of primary care physicians are equivalent to those of subspecialists
  - A sort of "NIH for medical education" to support research
- Responsibility to meet societal need:
  - Societal needs must be assessed nationally; individual programs must then find a way to respond to national needs.
- Oversight and regulation:
  - The ACGME is necessary.
  - Standardization should be increased across the specialties.
  - The transition should be hastened from its current focus on process measures to a focus on outcome measures that are part of the accreditation process.

MAXIMIZING THE EFFICIENCY AND EFFECTIVENESS OF LEARNING

MODERATOR » MOLLY COOKE, MD

Plenary Discussion

Dr. Cooke set the stage for a large-group discussion of ways to maximize learning by reviewing contemporary understanding of how people learn, the need for lifelong learning, and the role of faculty. She encouraged participants to create a vision of what residency education should look like that is powerful enough to overcome financial, political, historical, and other concerns, and to identify core or key features of residency education.

Questions for plenary session:

Q» *Which residency practices best reflect contemporary understanding of how people learn? Where are there opportunities to infuse the residency experience with modern conceptions of learning?*

Q» *How can we better align patient-based and non–patient-based learning to improve patient and population outcomes and enhance educational efficiency?*

Q» *Which non–patient-based approaches (e.g., simulation or computer-assisted instruction) complement the learning from patient care? Should these be required elements of all GME programs?*

Q» *What are the gaps between how clinical supervision is currently conducted and optimal developmentally appropriate supervision?*

Discussion

COMMENT: Putting the technical training early rests on a very solid theoretical foundation about motor learning and skills acquisition.

COMMENT: Sometimes we over-apply theories that we haven't really dug into well enough. One of the reasons that we got so carried away with self-assessment and left people in situations where they have no feedback and they're totally abandoned was a misapplication of the notion that adult learning theory meant that people just learn on their own once they're adults when, in fact, Malcolm Knowles never said that.

COMMENT: There's an opportunity to say this is evidence-based and should probably be done. This is not evidence-based or evidence points against this practice. Therefore, it should be discontinued. These things we don't really know for sure.

COMMENT: The residents don't always know what's most educational and valuable for them.

COMMENT: I don't think we want to be seen as against "service" because that is the core of the education.

COMMENT: Maybe the more productive way of pulling residents out of activities that are less valuable is to explain that there is limited time. We have to worry about educational efficiency, and then we have to choose between things that are all valuable. We're not "dissing" service.

COMMENT: We have an awful lot of assumptions in medical education about what works. Maybe it's time to test some of these assumptions.

COMMENT: The essential learning unit has always been the interaction between the resident and the patient, with the faculty giving context, meaning, and value to that experience. Residents will work really hard as long as they feel like the faculty is there and they're learning something from that.

COMMENT: You could look at almost any activity and say, does this activity serve either to move someone from the periphery to the center of the team rapidly or does it help them move from a novice to an expert? If the answer is no, rather than calling it service, maybe it's out-of-scope activity that belongs to another health professional or an administrator.

COMMENT: This is a matter of dollars and cents, a downloading of administrative costs to the workplace of residency education.

COMMENT: The real issue is the cost of training. In all of the experimental models that we've all worked with, the cost of training goes up because it's better training.

COMMENT: We're the problem. Hospital administrators don't sit around saying, "make that resident take the lab specimen down." We allow it to happen. Maybe we shouldn't be doing that if we think it's not a good use of their time.

COMMENT: If we were actually honest to the best of our abilities and categorized what we were doing and thought about it, I think that would move all of our training programs forward.

COMMENT: Supervision and assumption of responsibility work only if there is a culture in which residents feel comfortable calling for help when they're left alone and need help and do not fear recriminations or being considered weak or inept if they do call for help.

COMMENT: There is a distinction to be drawn between autonomy of thought and autonomy of action. Autonomy of thought ought to be encouraged from day one. Autonomy of action is earned over training. The arbiter of who decides how quickly and how much has to be a faculty member.

COMMENT: Supervision we tend to think of as something that's very hands on or reactive. We need to reconceptualize what that means. You can become increasingly indirect in supervision as you learn to trust. That's where the "entrustable" concept

becomes important, that someone will contact you when they're getting in over their head.

COMMENT: The faculty clearly have to be the people who are able to say, "Yes, you are ready to do, not just think."

COMMENT: Perhaps the role of GME is to carefully examine the objectives of training, the tasks of patient care, and the scope of practice by postgraduate year. That may allow us to eliminate some tasks or revise some objectives and serve as the framework to try to maximize the efficiency and the effectiveness of learning. We also need to assist the faculty in being better educators, being better role models.

COMMENT: We haven't spoken much about the ambulatory side of GME. . . getting residents engaged in real work situations where the content of their learning is about coordinating the management of chronic disease from an ambulatory perspective.

COMMENT: You can address most any competency in most any busy clinical environment, but in terms of maximizing efficiency, some environments are just more productive than others. I'm arguing that we start with what we want the residents to get out of experience X and argue backwards. You will see outpatient settings and nonclinical settings, including simulation, be efficient ways to address specific competencies.

COMMENT: There are empirical data that we generated at the VA. Over the past 10 years or so we've had a survey of perceptions of residents about a variety of different aspects of their education. Over that period of time we have cranked up significantly the level of supervision. . . . They haven't noticed a change in their level of independence.

COMMENT: We do have a lot of evidence that says just because the attending is in house does not mean that supervision gets any better. . . just because they're there doesn't mean they're participating in the care or that the resident is any more prone to go seek them out and get help with a question.

COMMENT: We need to realize the political environment in which we are living. If this comes out as a report that just complains about everybody else having to fix their house and ask for more resources, it's going to fall on deaf ears. There has to be a certain amount of introspection and acknowledgement that there are a number of things under our own control that we need to attend to.

COMMENT: Service versus education is a false dichotomy, not a useful dichotomy. It would be beneficial for us as much as possible to do away with this dichotomy and rather say, there's a continuum and there are some activities, some experiences that are low-yield and others that are more high-yield for education.

COMMENT: It's useful and productive for the program to systematically and regularly evaluate the high functioning and low functioning aspects of the curriculum.

COMMENT: There's a dual concept there. One is intentionality rather than letting things just happen by either accident or expedience and then review, because whatever appears good this year may not be good next year. Intentionality and review are two critical elements of program design.

CONSOLIDATION

MODERATORS » GEORGE E. THIBAULT, MD, AND DEBRA F. WEINSTEIN, MD

The consolidation session provided an opportunity to test consensus around the emerging recommendations, continue to challenge assumptions about GME, including the "sacred cows," and identify any missing recommendations. Dr. Weinstein noted that the planning committee would use the information from the session in developing draft recommendations to be sent to participants for review that night.

Discussion
Topic: Transitional year

COMMENT: Transitional year is one of the most competitive programs there is. It's not one that people settle for.

COMMENT: I'm hearing a lot of discomfort around trying to make an up or down decision, but a lot of conversation that there is an urgent need to examine the purpose of this year and do those purposes in a future health system make sense? Does it make sense even to give somebody a year for a license; do you really want that person out in the community?

COMMENT: Rather than say we should eliminate the transitional year, better define its purpose and not be a means to an immediate end, meaning a means to licensure, unless within that transitional year competencies are acquired that provide sufficient enough outcomes that we could feel comfortable licensing somebody to practice medicine.

Topic: Preliminary training

COMMENT: Do we want to eliminate the concept of preliminary training, that what we have previously called preliminary training should be regarded as the first year of training in the chosen specialty under the direction and supervision of that chosen specialty?

COMMENT: It's very important to consider the potential unintended consequences. The reason for general surgery is largely disappearing and the seeds of destruction of general surgery have been sown through the educational changes. Are we willing to say that internal medicine and pediatric departments should end because most people are intent on going to a subspecialty?

COMMENT: Urology, ENT and ortho; those all utilize prelim spots. They have not done away with them [the preliminary year].

COMMENT: It's an assumption that you need those two years in internal medicine because you need that preparation to enter a subspecialty. That's an assumption that's been built up. We've never empirically studied it. If you're in Turkey, you do cardiology from day one, for example.

COMMENT: The interns are being used mainly for service and they're not getting into the upper levels as much. There has been a trend and this evolution in ENT, ortho, and partly urology to actually take over as the primary program. However, general surgery still runs the rotations.

COMMENT: Before we can say that it should be eliminated or linked to the parent programs, we have to clarify why the changes have already occurred. If we do away with the so-called preliminary year, are we saying it should be within the same venue or that the educational content of that year should be directed by the parent RRC or some parent society and the trainee would have the option of getting that training separate from where they're going to do their surgical training?

COMMENT: If our goal is to improve the quality of the educational experience, this is simple. Speaking as a general surgery program director for many years, they are viewed as second-class citizens. They need to be put under the jurisdiction of the person who really feels a responsibility for their educational experience, which is their primary program director.

COMMENT: It's more than just the pedagogical issue. This is a structural issue that decreases your degree of freedom in doing innovation. A lot of the exciting and innovative things that we've been talking about are made more difficult with structural impediments like a preliminary year.

Topic: Last year of medical school

COMMENT: Because of all of the practical issues, that [eliminating the last year of medical school] has little or no chance of being accepted. Utilize the fourth year for preparation for the internship and increasingly add things like readiness experiences, so that they come in with a whole set of objectives already met for residency training. That's much more likely to get accepted.

COMMENT: I would like shortening the beginning to end of medical school rather than lopping off the last year, just to encourage more open-minded thinking about how that shortening might take place.

Topic: Challenging assumptions

COMMENT: Why are you putting an intern in an ICU on July 1st? It's service, but developmentally does it make sense? Maybe it does. So maybe we need to invert it on its head. Maybe we should encourage some different approaches to see if there are other things that might work better.

COMMENT: At my institution we implemented our work hour changes about six months ago. The burden of work or service has shifted significantly from our junior people to our senior people. We've further marginalized our youngest learners and they're no longer in the intimate core of intense decision making.
COMMENT: The needs in your country and our country [Canada] are very similar. We need doctors in relatively isolated areas. We need them in certain disciplines. And we need a multitude of strategies to achieve those. Just changing the composition of the team, but leaving them in the same environment, etc., is not going to achieve those goals.

COMMENT: If we are doing it on behalf of the public, the public spends a heck of a lot more time maintaining their health and well-being outside of the acute facility.

COMMENT: These discussions lead to a very fundamental question: Who owns GME? Is it the universities? Is it the hospitals? Is it the public? That question needs to be tackled head on. More and more it seems like hospitals are taking a lead role and starting to own GME. One has to question whether that is or isn't appropriate.

COMMENT: How does the hospital feel some ownership for the quality of the residency training program? It's generally going to be through the compensation.

COMMENT: Hospitals gain enormously from GME. One can bring a variety of pieces of evidence to suggest that ultimately the place to be if you're sick is in a teaching hospital. That's because the educational process truly contributes to the process of patient care that's delivered. It's because of the teaching mission that attracts the strongest house staff as well as the strongest faculty. It's the teaching mission that feeds into the investigative mission. There is no way that a hospital can be great or claim anything other than local significance without a strong educational commitment.

COMMENT: If I were sick I'd want to go into the most sophisticated and highly developed teaching hospital. However, the Larry Green study, replicated in the 1990s and published in *The New England Journal of Medicine*, said that for every 1,000 people in the community, three of them end up in a tertiary sophisticated hospital. Combine that with chronic disease management, which is an ambulatory condition today. How do we have a system that recognizes that the majority of the illness is in the community? How do we align GME to meet that need?

COMMENT: At a minimum we need to recommend incentives that would allow hospitals to actively move residents out of the hospital. It's not just to primary care sites. It's the nursing home sites. It's community-based training. That's a problem when the money is locked up in the hospital's vault.

COMMENT: I would be a little less bold. We need mechanisms by which the hospital, as the preeminent conveyer of that money, is "forced" to distribute money to the appropriate training sites. Some of that has already begun to happen with some changes in Medicare regulations.

COMMENT: We have a generation of residents graduating who have been taught error avoidance. They're over-supervised now for medical/legal reasons. What we have are residents who lack the ability to recognize errors and rescue errors because they aren't just experiencing enough of that or being trained in that. We ought to think about recommending purposeful and meaningful error training.

COMMENT: Other ways to fund GME include the use of vouchers. So residents have vouchers and carry them with them. Now you're competing for the residents based on your educational programs and what they're going to get. They control the money by bringing it with them to you.

COMMENT: One size doesn't fit all. There are disciplines where everything they do is in the hospital. To say that they should have education somewhere else—it doesn't make sense if you're an intensivist. There's a patient trajectory that's different for every discipline and the training should reflect that trajectory of the patient.

COMMENT: As we look at the way in which clinical care is going to evolve, to distribute our residents in a way that they are actually taking advantage of both the ambulatory and the tertiary care facilities is going to require cooperation and collaboration between educational institutions. This is different from how we now are doing it.

DAY 3

DISCUSSION OF CONFERENCE SUMMARY AND RECOMMENDATIONS

MODERATORS » GEORGE E. THIBAULT, MD, AND DEBRA F. WEINSTEIN, MD

Day 3 was devoted to reviewing a rough draft of the conference conclusions and recommendations that was delivered to participants after the conclusion of Day 2. Dr. Thibault noted that the draft was a starting point for structuring the discussions that had occurred over the last two days. He told participants that their input would be used to produce a revised draft that would be sent to them again for further input.

Dr. Weinstein charged the participants with identifying any important ideas and recommendations that were missing from the draft, anything that should not be in the draft, and information that had been misinterpreted in the draft. She also asked them to determine whether the strength of the recommendations was appropriate—bold enough, but not too bold and prescriptive enough but not too prescriptive—and whether the draft clearly conveyed the intended messages and was well organized.

Discussion

COMMENT: I'd like to see a more explicit statement about how we're going to more purposefully, in an ongoing way, prepare them for future practice during residency.

COMMENT: There are some key content issue—patient-centered care, shared decision making, involvement in individual panel and population improvement—that are missing in that early portion.

COMMENT: Toyota looks at unused employee creativity as one of its areas of waste. If we look at it as the way we see the problem, every one of us sitting at this table has backgrounds and positions that might actually preclude us from seeing certain solutions. How can you involve people who are closer to where the rubber

will meet the road, from a standpoint of looking at what physicians will need and where do they see things going from a practice standpoint?

COMMENT: I think we would like to see, at least in that last six months of practice, an opportunity for independent practice to prepare for real practice. This would have tremendous impact.

COMMENT: There's no avoiding the time that a physician is going to practice for the first time in any area of medicine without someone directly looking over his or her shoulder. The only choice that we have is where and when this happens. This has been the traditional justification for viewing residency, and fellowship, as the period in which the physician develops the capacity for the independent practice of medicine, so that if a problem does arise, help is immediately available. It might be better to say something like "demonstrability for the practice of medicine without direct supervision," or something of that sort.

COMMENT: It's important to acknowledge the duty hour restrictions, which will impact how important it is to maximize the efficiency of the training sites and patient care responsibilities.

COMMENT: We may have a role to explicitly say, given the limited amount of time there is for physician training, that time should always be maximized with the best educational opportunities.

COMMENT: If we're looking at it from a population-based perspective, people will have functional and cognitive issues that often aren't seen as directly as the diagnostic procedural issues. Maybe call out the increasing number of people who have a triad of medical conditions, cognitive issues, and functional issues that have an impact on how people will receive health and medical care.

COMMENT: In terms of the greater public needs, it would be nice to have a forum that helps to set what those needs are and in what direction we should be headed.

COMMENT: One of the words that I like to use is community engagement. It's the issue of having the GME programs engage the community in which they exist, to be able to know the needs and meet those needs, and help provide the right kinds of sites for training.

COMMENT: The needs of the public are not only to have providers, but they're to have the innovation, the research. Somehow we have to get that in.

COMMENT: We've lost some of the work that's been done previously on information technology and communicating with patients via new mechanisms of technology, and the cost awareness that residents should learn about the cost of medical care and how to make decisions based on being cost aware.

COMMENT: I was deeply concerned about being proscriptive about the amount of time that should be shortened, and the word "should."

COMMENT: Rather than being proscriptive about the amount of time that should be lopped off of the previous training, we should have more intervention on the part of what the subspecialty people want, and that would inform the decision about how much shorter it should be.

COMMENT: When you're dealing with uncertainty in a complex situation, you don't want to be proscriptive. You want to encourage innovation, try different things, study different things, fund different things to see which things work. That guiding principle should be flexible to allow innovation, as long as innovation is rigorously studied and funded.

COMMENT: We need subspecialty pathways that integrate the core competencies in the specialty, rather than saying two years, three years, so that the flexibility would come in the redesign of the subspecialty pathways.

COMMENT: If we focus training purely on education, we think there is the potential to shorten by up to a year the progress towards minimal competency of a trainee. We need to be very explicit about our thoughts.

COMMENT: It's really important to think about, who's the audience for this report and what do we want them to do with it? Our goal is that this is going to be used by others to catalyze innovation. We want people to try stuff. . . .In my community, there's a lot of people who want to innovate, and the biggest barrier right now is not the regulatory system; it's their community who does not want them to try stuff because it's threatening,

COMMENT: If there are innovations, or pilots, that are designed with an evaluation plan, that are hypothesis- or theory-driven, we, as the regulators, should allow those to move forward so that we don't fall back on regulations that may not be up to speed or up to date.

COMMENT: Regulation is a problem, but the far bigger problem is the culture. In the profession, no one wants us to change.

COMMENT: If the culture is going to change substantially, we're going to have to involve teaching faculty. The reason we've been still is because faculty has not been involved in these changes.

COMMENT: Training activities should be designed to advance training objectives at a maximal educational margin, and then say, activities that are low-margin should be identified and eliminated from the portfolio, as a sort of academic threat.

COMMENT: I would acknowledge the restrictions on everything by the debt burden that students carry into residency. I would recommend that we expand the federal opportunities, which already exist, specifically, the National Health Service Corps and the HHS Commission Corps Service, to include all specialties. These have opportunities for appealing to the altruism of students and also allowing them to have loan forgiveness and service in health profession shortage areas.

COMMENT: Dealing with this issue of either expanding existing programs or creating new programs that might get to this workforce distribution issue should maybe be included under the research component.

COMMENT: That should be in the recommendations because when we're talking about addressing the needs of the public, we have programs that can actually get residents out into various areas that are underserved.

COMMENT: To say across the board that new types of training sites must be added, I thought was overreaching. As I went through the list, some of these are quite pertinent to some specialties and not at all pertinent to others.

COMMENT: I would like to see a stronger statement about sites. Right now, we demand, by virtue of our resources, where we can provide the care, people come to us. If we are really looking at where care is moving to in the 21st century, it's going to

be more distributed. People are getting dialysis at home, people are doing things at home that they never did before, or in sub-acute centers.

COMMENT: I want to maybe simplify it to the degree that the training sites should be aligned with the needs of the public, rather than then to get into the specifics.

COMMENT: The revolution is to align everything with an ultimate impact on the good of society. It's an enormous cultural change.

COMMENT: I wondered if there's a way of maybe crafting the Can-Meds as an example, as opposed to a preferable system. . . .Think about what is in the Can-Meds that perhaps appeals to people. Thought should be given to defining standards for accreditation and clear assessment outcomes for the competencies beyond medical experts, as articulated in frameworks such as the Can-Meds competencies.

COMMENT: Conclusion number one is so foundational to this entire document that it should be in a category by itself. Everything that we're talking about is greater responsiveness of the current system to the needs of the public. It should be threaded throughout the document.

COMMENT: If we say we're going to have a forum, what does that mean? My public is different from your public, and there are dimensions of the public, or sectors of the public, who need to have their voices heard, that will never come to a forum, so it's too prescriptive.

COMMENT: When you state it's the responsibility of institutional leadership, we need to sell the case that, this is their responsibility, and actually, it's been affirmed by legislation that they have to be responsive to the public, and link this new accountability measure so, for instance, the quality of education is linked to the quality of care.

COMMENT: When we talk about institutional leadership, I want to make sure that we're very clear that audiences know that this is not just academic centered, but it's also health centered, because who is the institution that you're talking about? If you're only talking to the academic centers, hospital administrators won't pick up on this and say, "It's part of my responsibility as well, to provide these resources in this educational environment."

COMMENT: It might be useful for our audiences to explicitly state that competence is a minimum. It's not the goal, it's the floor, and we're trying to inspire excellence beyond competency, but we want to assure competency.

COMMENT: Except for medical knowledge and clinical care, the other four competencies people can barely remember, let alone evaluate or teach. We talked about the need to develop metrics on all six competencies, and also to disseminate teaching examples and modules about how to teach the other four competencies.

COMMENT: What is the public's need? It's not solely for service providers to take care of patients. There's also a public need for research to advance the field, to innovate, and somewhere we have to put in the flexibility, not just for the individual trainee to move at a different speed, but also, the accreditation procedure for programs, which will allow some variation, some flexibility, to allow certain programs to focus on one area, and certain programs to focus on another, as long as some basic competencies for the program, are achieved.

COMMENT: We make references to trainees knowing what they want to do from the get go; I'm not sure that that's really true. There's tremendous pressure to label yourself as, "I'm about to be a whatever," and so folks kind of pick things. Nobody says, "I don't know what I want to do," but I think the truth is, a lot of us don't know what we want to do. This broadening of exposure is really critical to career choice options.

COMMENT: Where we talk about new core content, to me, the language kind of circles the heart of what we want, which is, to make sure that our trainees get an understanding of the needs of the public, or that they want to acquire skills to assess and understand the needs of the public.

COMMENT: It is important to provide the philosophy of the position that we're stating, so that rather than simply stating, "we believe the following fact," or "here's our assertion," some work that builds around it that talks about, "here's our belief, here's our philosophy."

COMMENT: It's very important for us to be sensitive to the goals that led to the current practices that we're suggesting are not good. For example, where did the preliminary year come from? There's always function in dysfunction, and if we ignore that underlying function, and simply try to address the dysfunction, we may lose

function or get resistance that is not understandable. . . .Say something along the lines of, "while we understand that that's what this year is intended to do, and we promote that, and we agree that it's useful, we think that that model can be made more efficient if we integrate throughout, rather than think about it as a bolus administration at the beginning of the educational exercise."

COMMENT: There is a danger in self-evident statements, for example, "training activities should promote training goals." There is nobody who doesn't think that. Make sure you don't create situations in which people can say, "Well yes, of course, that's what we're doing." Adding in the philosophy, and the logic, and the lead up to the statement, rather than simply making a set of statements, is going to go a long way to helping the persuasiveness of the argument.

COMMENT: To believe that we can make bold statements that are going to solve these problems without acknowledging the fact that there are tensions associated with some of these things, like the service and learning, we may never get rid of the tension, but we can manage the tension, and if we think about trying to manage tensions, rather than get rid of them, we're going to be in a position to create more sophisticated arguments.

COMMENT: In our place, there are three preliminaries. People that didn't get what they wanted, we would take them. And the RRC makes you keep track of what happens to those people. In 25 years, 100% have landed a position they're satisfied with, either with us, because somebody got sick or dropped out, or that we've negotiated for them in another place. . . . It [the preliminary year] serves a very good purpose; it gets people through a little bit different pathway on where they want to go.

COMMENT: To throw out all preliminary residents is not a good thing because those preliminary spots, especially in things like surgery, do serve a purpose of being the safety net for people who don't match the first time. There are different reasons and functions for prelims, and we probably need to be a little bit more specific about our recommendations.

COMMENT: The fundamental change from having teaching hospitals be covering the service to specifically designed curricular experiences is such a fundamental change for pretty much everybody in GME who's done it for awhile that we need to articulate that really clearly.

COMMENT: The concept that we serve the public permeates everything we do, and everything we suggest comes from that, so how do we serve the public? We produce individual physicians into various residency programs on the assumption that if we can do a better job in the process of education, we will produce physicians who will practice in a much more thoughtful, cost-effective, appropriate, safe style then we presently have.

The second way that GME serves the public, or doesn't serve the public, is on a population level: where doctors go to practice and what specialties they choose. If we wish to be radical, we could bring up having some type of central decision making for residency allocation that's titrated year for year for the perceived need for physician specialties.

COMMENT: It might be in everyone's benefit if there were a requirement that all physicians after residency, or at their last stage of training had, say, hypothetically, a two-year requirement for public service of some sort, maybe in an underserved area, for the public good. Possibly that could be linked with tuition forgiveness, which would allow a much more diverse group of individuals to enter medicine.

COMMENT: It's both shortage and mal-distribution. You're never going to get people to go to some of these shortage areas unless there is a tool by which they can be advantaged that way. We have that tool available, but it's limited right now by limiting it just to one specialty.

COMMENT: I have great skepticism about workforce projections. We have many examples as to how unreliable predictions are. Therefore, I do not support a statement that could be interpreted as saying that we endorse a national planning system for workforce, which translates into explicit, if you will, rationing of positions within GME.

COMMENT: We have a large experience at the Uniform Services University of recruiting students whom we pay to go to medical school in return for public service.

COMMENT: I have sensed a reluctance to future scan and decide what a physician will be doing 10 to 15 years from now, but I don't think we could really plan education until we have some sense of what that role will be.

COMMENT: There are lots of different ways to provide care. In California, we're doing a lot of education on group classes, physician-led group classes. For example,

we have a chronic conditions class where 20 patients with a certain condition will come to a class led by a physician or a resident. Part of reforming GME is to include specifics on what may be the future of health care.

COMMENT: Maybe we should frame this so that the following quality indicators must be a part of the ongoing continuous quality improvement assessment of a GME program.

COMMENT: Is there a way we can put something in that requires some kind of collaboration, a true partnership at the level of the C-suite, so that there's a greater understanding of what is needed in order to ensure the quality of GME programs?

COMMENT: We've used the term "alignment with the public good," but what is the public good and what does alignment mean? The alignment's the educational issue. The public good is a more of a policy issue at a broader level. If you were going to advise me as a DIO or a program director, could you give me some criteria for what alignment looks like?

COMMENT: We've created so much flexibility in some areas, and not enough in others that it leaves it up to interpretation of the individual person, program, or institution, as to what that optimal environment looks like.

COMMENT: How do we recognize and define the public good? One suggestion would be to define that as actions that advance the cause of patients. Anything that we do in education or practice that serves patients, whether it's better care, or more affordable care, or safer care, or more accessible care, is in the public good. If it's self-serving, rather than serving the interests of the patients, then it's not in the public good.

COMMENT: There have been a number of documents that actually have defined public good.

COMMENT: People will need more concrete guidance on what alignment is. It's not enough to recognize it, but how does one describe, or measure, that alignment is actually taking place?

COMMENT: I would put forth a recommendation that we're explicit in regards to providing smoother transitions from undergraduate medical education to GME, and that we say we would encourage discipline-specific expectations for medical school graduates going into GME programs.

COMMENT: There's a tension between whether a good program is defined by the outcomes that it produces or whether it's defined by the process by which those outcomes arise. I wonder whether it's within the scope of what we're talking about to start addressing whether we're talking about trying to create flexibility of activities by defining outcomes and having principles, but not criteria, for process, or whether we really are talking about defining criteria for process.

COMMENT: Quality and safety is where there's movement afoot that people can do. . . .Be more explicit about quality and safety improvement projects, because that does resonate and is measurable.

COMMENT: There are two sort of domains of the public good: the big societal issue, of which there's much reference and many articles, and what are the core public good issues in the educational competencies that are much more directly related to our discussion? One of those is this issue of patient-centered care.

COMMENT: Rather than to specify the funding [for research], another approach would be to say that it could be modeled on another institution. The National Library of Medicine is the best analogy I can think of where it maintains a set of informational resources, but also can award R01 funding. It's something like that.

COMMENT: Threading the issue of meeting the needs of the public through this document is essential.

COMMENT: With the recommendations, we need to reach concrete conclusions based on what we see now. There's also a need to anticipate so that we're not just reactive, we're proactive.

COMMENT: Rather than the recommendation on shortening, we ought to be more transparent about how we've arrived there, so something along the lines of, "duration of training in core specialties ought to be defined by achievement of competency, rather than completion of a predetermined number of years," and then specify within that, for trainees with plans for future subspecialization, core specialty training, in many instances, should be shortened by one year.

COMMENT: If we're going to say that competency-based achievement should be the standard, then we also should instruct regulatory agencies to figure out how they would deal with Dan finishing in March and Andrea finishing in May, and me finishing a year late. Otherwise, we're saying there should be a new way of doing it, but we haven't asked anybody to figure out how to make this work.

COMMENT: A lot of times when we're talking about patient-centered activities, we think we're doing patient centered, but patient centered is really an issue where you are the patient, and you look at it from the patient's perspective. Unless we're looking at it from a patient's point of view, you will have a tough time of figuring out what that definition really means.

COMMENT: I would recommend including all the six aims. "Patient centered" is very important, but it's very important also to include the other context items, because "patient centered" by itself is not enough. It needs to be safe and timely and effective, and the other parameters, efficient, equitable.

COMMENT: Something that is missing, to some extent, in this document is population health, which is different from the public good, or public in terms of thinking about patient-centered care. Sometimes patient-centered care is intentioned with what might be good for population health, so we have to make sure that our residents are trained in understanding population health as well.

TABLE OF CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS	RECOMMENDATIONS
I. GME must meet the needs of—and be accountable to—the public.	• GME must create and maintain a dynamic, ongoing exchange with the public through appropriate partnerships that engage communities in feedback, analysis, and planning. • Evaluation of GME at the institutional and national levels should be transparent. • The GME system should be proactive in responding to and anticipating significant changes in health care delivery and practices.
II. High-quality GME requires experience with a diverse mix of patients, clinical problems, and health care delivery mechanisms to support a curriculum that addresses evolving patient, population, and health care system needs and expectations.	• The sites of training should expand to reflect current and future patient care needs. • The content of training should expand to include topics essential for current and future practice—particularly those related to professionalism, population medicine, and working effectively in the health care system. • Education should occur across historic professional boundaries to consistently incorporate inter-specialty and inter-professional education into GME. All residents should have opportunities to learn with and from physician colleagues in other specialties and from other health professionals.

CONCLUSIONS	RECOMMENDATIONS
III. There is both need and opportunity for greater efficiency in delivering GME. Accomplishing this will also help to address national physician workforce needs, while enhancing the quality of training.	• The length of GME should be determined by an individual's readiness for independent practice—demonstrated by fulfillment of nationally endorsed, specialty-specific standards—rather than tied to a GME program of fixed duration. • The defined period of general specialty programs required as a prerequisite to subspecialty training/practice should be evaluated and, where possible, shortened to improve educational efficiency. Opportunities for reducing the required duration of subspecialty fellowship training also should be explored.
IV. Medical education represents a continuum of lifelong learning. Phases and transitions between the phases of medical education should be examined with regard to coordination, efficiency, and appropriate performance assessment.	• For all students, a flexible but more rigorous use of the final year of medical school should focus in part on ensuring that the skills and intellectual, technical, and professional development necessary for entering the individual's chosen specialty have been achieved, thereby providing a better transition into GME. Students who have met appropriate milestones might graduate earlier from medical school and enter GME sooner. • Independent preliminary programs, tracks, and positions should be eliminated. Instead, necessary prerequisite education should be incorporated into each core residency, giving the program director authority and responsibility for the curriculum, organization, and assessment of residents throughout their education in the specialty (thus eliminating unnecessary transitions within GME).

CONCLUSIONS	RECOMMENDATIONS
IV (cont.). Medical education represents a continuum of lifelong learning. Phases and transitions between the phases of medical education should be examined with regard to coordination, efficiency, and appropriate performance assessment.	• A period of "monitored independence" must be provided within GME to confirm each physician's readiness for independent practice.
V. GME must be organized and supported at the institutional and national levels to ensure that residency and fellowship programs are 1) designed and conducted according to sound, broadly endorsed educational practices, within an environment conducive to education; and 2) given sufficient flexibility to innovate and achieve optimal outcomes.	• Empowered educational leaders should ensure that (specified) educational principles and practices serve as the foundation of GME programs. • Flexibility should be allowed and encouraged at both the program and individual trainee levels to enhance training for the varied physician roles required to meet the full spectrum of society's health care needs
VI. Health professions education requires a robust body of knowledge—beyond what is currently available—to optimize quality and outcomes.	• To best leverage the large public investment in medical education for the greatest good to society, a "National Institute of Health Professions Education" should be established and charged with coordinating, prioritizing, and funding research on health professions education, with a substantial focus on GME.

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Kathryn Andolsek, MD, MPH, is a Professor in Duke University School of Medicine's Department of Community and Family Medicine and Duke School of Nursing. She received a BS, MD, and MPH From Northwestern and practiced with the National Health Service Corps in inner-city Chicago. She has learned from GME experiences in academic and community health settings, decentralized models, and in urban, suburban and rural areas. Dr. Andosek joined Duke GME as the associate Designated Institutional Official (DIO) with responsibility for 76 ACGME programs, 57 non-accredited programs, and over 975 residents. She has been the Course Director for the AAMC GME Leadership course and an ex offico member of the GRA Steering Committee. Her *LIFE Curriculum*, funded in part by the Josiah Macy Jr. Foundation, focused on resident fatigue and well-being, reached over 2,700 live participants, was distributed as CD ROM and Web materials to over 5,000 others, and was accepted "with acclamation" by AAMC MedEdPORTAL.

Jonathan F. Borus, MD, is the Harvard Medical School Stanley Cobb Distinguished Professor of Psychiatry and Faculty Dean for Education at Brigham and Women's Hospital (BWH), where he coordinates the hospital's medical education efforts with those at Harvard. He also co-chairs the Partners HealthCare Education Review Board and serves on the ACGME's Psychiatry Residency Review Committee. After serving as Program Director of the Massachusetts General Hospital (MGH) Psychiatry Residency from 1976-90 and Chair of the MGH Committee on Teaching and Education from 1983-90, Dr. Borus became Chairman and Psychiatrist in Chief of the BWH Department of Psychiatry from 1990 to 2008 and was instrumental in the development of the Harvard Longwood Psychiatry Residency Program. From 2008 to 2010 he was the Director of Medical Education for BWH, fostering the teaching and careers of medical educators in all specialties, and from 2006 to 2010 he served as co-chair of both the BWH and Partners Education Committees. Dr. Borus has served as the President of the Association for Academic Psychiatry and Editor of the journal *Academic Psychiatry*. He is the recipient of the American Psychiatric Association and National Institute of Mental Health Vestermark Award for Psychiatric Education and the Harvard Medical School Excellence in Mentoring Lifetime Achievement Award.

Lois L. Bready, MD, is Senior Associate Dean for Graduate Medical Education and DIO at the University of Texas Health Science Center at San Antonio, where she is responsible for 750 residents in over 50 ACGME-accredited programs and 25 non-accredited programs. In addition, she chairs her institution's GME and GME Executive Committees and is a 2009 ACGME Parker J. Palmer *Courage to Lead* Award recipient. She is a tenured professor and Vice Chair in the Department of Anesthesiology, for which she served as residency program director for 10 years; is a senior oral board examiner for the American Board of Anesthesiology; and recently completed service on the ACGME RRC for Anesthesiology. She is senior editor of *Decision Making in Anesthesiology,* now in its fourth edition, and provides anesthesia and perioperative care (including all-night in-hospital call) at University Hospital, a Level I trauma center.

Heather Brislen, MD, is an internal medicine resident at the University of New Mexico. She serves as a resident member on the ACGME residency review council for internal medicine, and in medical school she served as a student member on the Liaison Committee for Medical Education. She co-chairs the resident council for the University of New Mexico and has been active in medical education efforts in student and resident sections of the American Medical Association. In 2009, she completed a health policy fellowship through the Robert Wood Johnson Foundation Center for Health Policy and the New Mexico Medical Society, where she studied health care reform in New Mexico and worked with the state legislature on a bill to support patient-centered medical homes.

John B. Bulger, DO, is the Chief Quality Officer for the Geisinger Health System. He served as the Associate Chief Academic Officer for Osteopathic Medical Education for Geisinger Health System until July. Dr. Bulger is a recognized leader in osteopathic graduate medical education. He serves as the chair of the Council of Education and Evaluation for the American College of Osteopathic Internists (ACOI) and the American Osteopathic Association's Program and Trainee Review Council, the national accrediting body for osteopathic graduate medical education programs. Dr. Bulger has written and contributed to numerous publications as well as standards and medical education processes. Dr. Bulger also serves as Geisinger's Director of the Hospital Medicine Service Line. Dr. Bulger developed Geisinger Medical Center's hospitalist model in 2000 and lead the program's maturation. This included innovations in resident and student education, participation in nationally recognized research and performance improvement projects and growth of the Geisinger hospitalist model.

Nick Busing, MD, CCFP, FCFP, is President and CEO of the Association of Faculties of Medicine of Canada (AFMC). Prior to joining AFMC, Dr. Busing spent 20 years at the University of Ottawa Faculty of Medicine in a number of positions including Program Director in Family Medicine, Assistant Dean for Postgraduate Medical Education, and Chair of the Department of Family Medicine. Dr. Busing has led a process of expansion at AFMC, with an increased emphasis on advocacy on behalf of Canada's Faculties of Medicine in areas of medical education and health research. In addition to his advocacy work for AFMC and responsibilities relating to accreditation, Dr. Busing led a Health Canada–funded project entitled "The Future of Medical Education in Canada: MD." Currently, Dr. Busing, representing AFMC, together with partners from le Collège des médecins du Québec, the College of Family Physicians of Canada, and the Royal College of Physicians and Surgeons of Canada, leads a project relating to the Future of Medical Education in Canada: Postgraduate.

Robert A. Cain, DO, FACOI, has been the Director of Medical Education for Grandview Medical Center System/Kettering Health Network in Dayton, Ohio since 2006. Prior to this, he served for 7 years as the director of the internal medicine residency program at the same facility. He was selected by American College of Osteopathic Internists (ACOI) as their teacher of the year in 2004. He serves as an advisor to the Ohio-CORE internal medicine residency program advisory committee, as a Board member of the Association of Osteopathic Directors and Medical Educators (AODME), President of the Ohio Osteopathic Directors of Medical Education, and as Vice-chairman of the ACOI Council on Education and Evaluation. His personal interest is the development of educational models to change physician practice behavior, both during training and in private practice. He is certified in both internal medicine and pulmonary medicine by the American Osteopathic Board of Internal Medicine and maintains a limited clinical consultation practice focused upon pulmonary rehabilitation. He is a 1988 graduate of the Ohio University College of Osteopathic Medicine and a 2009 graduate of Midwestern University's Costin Institute for academic leadership.

Molly Cooke, MD, FACP, is a Professor of Medicine at the University of California, San Francisco, where she holds the William G. Irwin Endowed Chair as Director of The Haile T. Debas Academy of Medical Educators. Dr. Cooke has been active in medical education program development throughout her career. She was the founding director of "Foundations of Patient Care," an innovative six-quarter, preceptorship-based course for first- and second-year medical students, and has

taught in the Parnassus Integrated Student Clinical Experiences program since its inception. Among her many awards for teaching is the 2006 AOA Robert J. Glaser Distinguished Teacher Award, Association of American Colleges. She is coauthor, with Drs. David Irby and Bridget O'Brien, of *Educating Physicians: A Call for Reform of Medical School and Residency* (Jossey-Bass/Wiley, 2010). Dr. Cooke served as the Governor of the Northern California chapter of the American College of Physicians from 2004 to 2009, and she currently serves as a Regent of the College. Dr. Cooke received her undergraduate and medical degrees from Stanford University.

Malcolm Cox, MD, is the Chief Academic Affiliations Officer for the Department of Veterans Affairs, where he oversees the largest health professions education program in the United States. Previously, he was Chief of Medicine at the Philadelphia VA Medical Center, Associate Dean for Clinical Education at the University of Pennsylvania, and Dean for Medical Education at Harvard Medical School. Over the past 5 years, Dr. Cox has led a major expansion of VA's medical, nursing and associated health training programs and an intensive re-evaluation of VA's educational infrastructure and affiliation relationships. At the same time, he has repositioned the Office of Academic Affiliations as a major voice in health professions workforce reform and educational innovation. Dr. Cox currently serves on the National Leadership Board of the Veterans Health Administration, the National Advisory Committee of the Robert Wood Johnson Clinical Scholars Program, the National Board of Medical Examiners, and the Accreditation Council for Graduate Medical Education.

Debra A. DaRosa, PhD, is a Professor of Surgery at the Northwestern University Feinberg School of Medicine, and the Vice Chair of Education in the Department of Surgery. With a doctoral degree in education, she has been a surgical education specialist for over 30 years. She has dedicated the majority of that time to developing and delivering faculty development programs, pursuing educational research and consulting with clinical departments and professional societies. Dr. DaRosa is the course director for the highly subscribed American College of Surgeons' (ACS) 6-day *Surgeons as Educators* course and is the Editor-in-Chief of the ACS's Residency Assist Page, an electronic advice column for surgical program directors. She teaches annual faculty/resident teacher development programs for the Association of Professors in Gynecology and Obstetrics, the ACS, and the Joint Council on Thoracic Surgery Education. In 1990, she earned the distinction of being the first non-clinician to be elected President of the Association for Surgical Education. This same organization honored Dr. DaRosa with the Distinguished

Educator Award in 2001. She has received Outstanding Scientific Paper Awards from the Association of American Medical Colleges and the Association for Surgical Education. Dr. DaRosa has published over 100 peer-reviewed abstracts, papers and book chapters. She is a popular speaker invited to present her research and faculty development programs at regional, national and international forums.

Gary L. Dunnington, MD, joined the faculty at Southern Illinois University in 1997, where he is currently the J. Roland Folse Professor and Chair of Surgery. He received his medical degree from Indiana University and completed surgical training at the University of Arizona. Dr. Dunnington came to Southern Illinois University after 6 years at the University of Southern California (USC), where he was Associate Professor of Surgery and Senior Associate Dean for Academic Affairs for the School of Medicine. Dr. Dunnington's area of clinical practice is surgical oncology, with a focus in breast and endocrine disease. He has developed two multidisciplinary breast centers, first at the USC Norris Cancer Center and later at Southern Illinois University, for which he continues to serve as Medical Director. He has served as principal or co-investigator on research projects totaling more than $5.6 million and has more than 100 peer-reviewed publications. In 2010 he received the AOA Robert Glaser Distinguished Teacher Award from the American Association of Medical Colleges. He is a Past President of the Association for Surgical Education and received the 1999 Distinguished Educator Award from this organization. He is one of the five founding faculty of the American College of Surgeons' "Surgeons as Educators" course and served as a faculty member for 15 years.

Timothy C. Flynn, MD, FACS, received his medical degree with honors from Baylor College of Medicine in 1974. He did his internship at Navy Hospital, San Diego, followed by 2 years as a general medical officer, which included a year as the physician for Operation Deep Freeze in Antarctica. Upon completion of his Navy obligation, he returned to Houston and completed his surgery residency at the University of Texas and remained as faculty until coming to the University of Florida in 1984. At the University of Florida, Dr. Flynn rose through the ranks to become Professor of Surgery in 1994 and served as the General Surgery Residency Program Director from 1993 through 2003. He is currently the Senior Associate Dean for Clinical Affairs for the University of Florida College of Medicine. Dr. Flynn's numerous awards include the Roche Award as Senior Medical Student from Baylor College of Medicine; the Navy Achievement Medal; the Outstanding Faculty Award from the University of Florida, General Surgery; and the Edward M. Copeland Chief Resident's Award, University of Florida. Dr. Flynn is the past chair of the American Board of

Surgery and is currently Chair of the Accreditation Council for Graduate Medical Education Board of Directors. He is also Chair of the American College of Surgeons Board of Governors. Dr. Flynn's clinical interests include dialysis access, limb salvage, and complications from vascular interventions.

Gus M. Garmel, MD, FACEP, FAAEM, is Co-Program Director of the Stanford/Kaiser Emergency Medicine Residency Program and Clinical Professor (Affiliated) of Surgery (Emergency Medicine) at Stanford University. He serves as Clerkship Director for Surgery 313D (Emergency Medicine), Stanford University School of Medicine and Team Leader for the American Board of Emergency Medicine oral examinations. Dr. Garmel is a Senior Emergency Physician for The Permanente Medical Group (TPMG), Kaiser Santa Clara, CA, and Senior Editor for *The Permanente Journal*. He has received several national honors including CDEM's Distinguished Educator Award (2011), AAEM's Peter Rosen Award (2010), EMRA's Mentorship Award (2010), AAEM's Program Director of the Year Award (2008), and EMRA's Excellence in Teaching Award (2001). One of his three textbooks won first place in the AMWA Medical Book Awards competition, Physicians category (2006). Dr. Garmel has authored numerous peer-reviewed journal articles, textbook chapters, and has been invited to give presentations internationally and nationally on resident and student education, mentoring, leadership, conflict resolution, and professionalism in emergency medicine.

Gwen Wagstrom Halaas, MD, MBA, is Senior Associate Dean for Academic and Faculty Affairs at the University of North Dakota School of Medicine and Health Sciences and Associate Professor in the Department of Family and Community Medicine. Dr. Halaas received her medical degree from Harvard Medical School and a Masters in Business Administration in Medical Group Management from the University of St. Thomas. Dr. Halaas has worked in medical education since 1986 as faculty, assistant director, and program director of two family medicine residency programs and director of a rural longitudinal program for medical students. She has also been a leader, teacher, and advisor for interprofessional health education. She was named the Minnesota Academy of Family Physicians Teacher of the Year in 2008. Dr. Halaas has worked in administrative leadership for large health plans and as a consultant in professional health and wellness. She has written books, chapters, and articles on professional wellness and medical and interprofessional education. She was profiled for her administrative leadership in Fitzhugh Mullan's book, *Big Doctoring in America: Profiles in Primary Care*.

Jennie Chin Hansen, RN, MSN, FAAN, is CEO of the American Geriatrics Society (AGS) and immediate past President of AARP. She spent nearly 25 years with On Lok, Inc., a nonprofit family of organizations providing integrated, globally financed, and comprehensive primary, acute, and long-term care community-based services in San Francisco. On Lok is the prototype that became the Program of All Inclusive Care to the Elderly (PACE), a global payment, integrated care delivery system for Medicare and Medicaid targeted to complex, multi-morbid elders, enacted in 1997. PACE now has programs in 31 states in urban and rural settings. In 2011 she completed a six year term as Federal Commissioner of the Medicare Payment Advisory Commission (MedPAC). In May 2011 she assumed the role of Board Director of the Institute for Healthcare Improvement (IHI). She also serves as a Board Director of the SCAN Foundation and the National Academy of Social Insurance, advisory member of the Equity of Care Committee of the American Hospital Association and member of the National Quality Forum Measures Application Partnership for Dual Eligibles.

Diane M. Hartmann, MD, is the Senior Associate Dean for Graduate Medical Education and Professor of Obstetrics and Gynecology at the University of Rochester School of Medicine and Dentistry, where she also earned her medical degree. Dr. Hartmann is responsible for the University's 75 residency and fellowship programs and over 700 graduate medical trainees. She is currently a member of the Board of Directors of the American Board of Obstetrics and Gynecology and serves as an Oral Board Examiner. Dr. Hartmann is Chair of the Council on Residency Education in Obstetrics and Gynecology and is a member of the Accreditation Council on Graduate Medical Education's (ACGME) Review Committee for Obstetrics and Gynecology. She was recently appointed to the American Association of Medical Colleges National Advisory Panel on Medical Education. In recognition of her commitment and contributions to graduate medical education, she received ACGME's Parker J. Palmer Courage to Lead Award in 2009. In addition to these responsibilities, she continues to practice gynecology with a special focus in the areas of menopause and geriatrics.

Richard E. Hawkins, MD, FACP, joined the American Board of Medical Specialties (ABMS) in 2009 as Senior Vice President for Professional and Scientific Affairs. In this capacity he provides leadership for the Board's efforts in physician certification and assessment. Dr. Hawkins has more than 20 years of experience working on various initiatives to assess and evaluate physician quality and competency. Prior to assuming his current position with ABMS, he was the Vice President for Assessment Programs at the National Board of Medical Examiners in Philadelphia. He is board

certified by the American Board of Internal Medicine in internal medicine with a subspecialty in infectious disease.

Eve J. Higginbotham, SM, MD, assumed the position of Senior Vice President and Executive Dean for Health Sciences at Howard University in 2010. She has published over 100 peer-reviewed articles and coedited four textbooks in ophthalmology. Dr. Higginbotham has been elected to the Institute of Medicine and the American Academy of Arts and Sciences and is an elected member of the Board of Overseers for Harvard University. She earned undergraduate and graduate degrees in chemical engineering from MIT and received her medical degree from Harvard Medical School.

Brian David Hodges, MD, PhD, FRCPC, graduated from Queen's University Medical School in 1989, completed psychiatry residency at the University of Toronto in 1994, a Master's of Higher Education in 1995 and a PhD in 2007. Since 2003, he has been Director of the University of Toronto Wilson Centre, one of the largest centres for health professional education research in the world. From 2004-2008 he was Chair of Evaluation for at the Royal College of Physicians and Surgeons, overseeing assessment in the 62 specialty programs in Canada. Internationally he has worked with medical schools and licensure organizations in New Zealand, Switzerland, Poland, Japan, Jordan, Israel, France, China, Australia and Ethiopia. In 2003 he spent a year at the University of Paris, earning a diploma in Health Economics and Social Sciences and established collaborations with the University of Paris and the Ecole des Hautes Etudes en Santé Publique (EHESP) where he continues to serve as a member of the education board. He was named Full Professor and Richard and Elizabeth Currie Chair in Health Professions Education Research at University of Toronto in 2009. In 2010 he became Vice President Education at the University Health Network (Toronto General, Toronto Western and Princess Margaret Hospitals) one of Canada's largest teaching hospitals.

Eric S. Holmboe, MD, is the Chief Medical Officer and Senior Vice President at the American Board of Internal Medicine and the American Board of Internal Medicine Foundation. He is also Professor Adjunct of Medicine at Yale University and Adjunct Professor at the Uniformed Services University of the Health Sciences. In his previous position, he was Associate Program Director for the Yale Primary Care Internal Medicine Residency Program, and Director of Student Clinical Assessment for Yale School of Medicine. He also worked with Qualidigm, Connecticut's Quality Improvement Organization, as a Clinical Quality Coodinator. Dr. Holmboe's research

interests focus on interventions to improve quality of care and methods in the assessment and evaluation of clinical competence. Dr. Holmboe is a graduate of Franklin and Marshall College and the University of Rochester School of Medicine. He completed his residency and chief residency at Yale-New Haven Hospital, and was a Robert Wood Johnson Clinical Scholar at Yale University.

Michael M. E. Johns, MD, assumed the post of Chancellor for Emory University in 2007. At Emory Dr. Johns engineered the transformation of the Health Sciences Center into one of the nation's preeminent centers in education, research, and patient care. He previously served as Dean of the Johns Hopkins School of Medicine and Vice President for Medicine at Johns Hopkins University from 1990 to 1996. Dr. Johns is widely renowned as a catalyst of new thinking in many areas of health policy and health professions education. He has been a significant contributor to organizations and policy groups in health care, including the Institute of Medicine, the Association of American Medical Colleges, The Commonwealth Fund Task Force on Academic Health Centers, and the Association of Academic Health Centers. He frequently lectures, publishes, and works with state and federal policymaker on topics ranging from the future of health professions education to national health system reform. Dr. Johns was elected to the Institute of Medicine in 1993. He received his bachelor's degree from Wayne State University and his medical degree with distinction at the University of Michigan Medical School.

Byron D. Joyner, MD, MPA, FAAP, FACS, has a passion for learning and designing better ways to improve graduate medical education. He is responsible for the core curriculum and competency-based training of the urology residents at the University of Washington. Last year, he was appointed as the Associate Dean for Graduate Medical Education and is charge of the educational learning environment for over 1,200 residents and fellows in 92 different training programs at the university. He has published widely in scientific journals and contributed some of the seminal articles for urology in the field of graduate medical education. Dr. Joyner graduated from Princeton University and received his medical degree from Harvard. He completed his residency at the Massachusetts General Hospital and then performed a research fellowship at the Boston Children's Hospital. Last year, he received a Master in Public Administration from the University of Washington, which he felt organized many of his principles of leadership. Last year, he received a Master in Public Administration from the University of Washington, which he felt organized many of his principles of leadership. This year, he was a recipient of one of the ACGME's coveted Palmer-Parker Courage to Teach awards. He is a Fellow of the American Academy of Pediatrics and the American College of Surgeons.

Steven L. Kanter, MD, serves as Vice Dean of the University of Pittsburgh School of Medicine. He draws from a diverse background of experience that includes clinical medicine, medical informatics, medical education, scholarly publishing, and medical school administration. In his current role, Dr. Kanter oversees the School's faculty affairs and academic programs. Dr. Kanter has played a key role in reformulating guidelines for promotion of faculty and has established a system of "promotion pathways" that provides an explicit framework for career development. Dr. Kanter also serves as Editor-in-Chief of *Academic Medicine*, the peer-reviewed journal of the Association of American Medical Colleges.

Curtis A. Lewis, MD, MBA, JD, has been the Chief of Staff for the Grady Health System and the Senior Vice President of Medical Affairs since 2000, and in this position he is responsible for overseeing nearly 2,000 physicians and physicians in training. He is also responsible for overseeing and insuring the quality of care delivered to the patients at the Grady Health System. He works closely with Emory University School of Medicine and Morehouse School of Medicine in providing clinical services at the Grady Health System and serves as the Associate Dean for Clinical Affairs for both medical schools. Dr. Lewis is the Past President of the National Society for Interventional Radiology. He has served on many national committees including the Standards of Practice Committee for both the American College of Radiology and the Society of Interventional Radiology. Dr. Lewis is an examiner for the American Board of Radiology in his specialty of interventional radiology. He was inducted as a Fellow in the Society of Interventional Radiology, the American College of Radiology, the National Hispanic Medical Association, and the European Cardiovascular Interventional Radiological Society. Dr. Lewis is widely recognized for his role in developing venous access as a safe, successful procedure associated with significant cost reduction for hospitals and patients.

Kenneth M. Ludmerer, MD, is an internist, medical educator, and historian of medicine. He is Professor of Medicine and the Mabel Dorn Reeder Distinguished Professor in the History of Medicine in the School of Medicine and Professor of History in the Faculty of Arts and Sciences at Washington University in St. Louis. Dr. Ludmerer is best known for his work in medical education and health care policy. His books include *Genetics and American Society* (1972), *Learning to Heal* (1985), and *Time to Heal* (1999), an examination of the evolution of American medical education from the turn of the century to the present era of managed care. *Time to Heal* was nominated for a Pulitzer Prize and Bancroft Prize and was the first book by a living author to be selected for inclusion in The Classics of Medicine Library. Dr. Ludmerer

has been elected to the American Academy of Arts and Sciences, the Association of American Physicians, and the American Clinical and Climatological Association. Among his many honors are the Abraham Flexner Award for Distinguished Service to Medical Education of the Association of American Medical Colleges, the inaugural Daniel C. Tosteson Award for Leadership in Medical Education of Harvard's Carl J. Shapiro Institute, and the Samuel L. Goldstein Leadership Award in Medical Student Education of the Washington University School of Medicine. Dr. Ludmerer received an AB from Harvard College and an MA and MD from the Johns Hopkins School of Medicine.

Daniel Munoz, MD, MPA, is a post-doctoral fellow in the Division of Cardiology at the Johns Hopkins University School of Medicine. Prior to fellowship, he served as Assistant Chief of Service in the Department of Medicine at Hopkins. His clinical and research interests include preventive cardiology, acute coronary syndromes, and health policy. In 2008, he served as a member of the Institute of Medicine's Committee on Optimizing Resident Work Hours and Patient Safety. Dr. Munoz received his medical degree from the Johns Hopkins School of Medicine. In addition to his medical training, he holds a Masters in Public Administration from Harvard University's John F. Kennedy School of Government and a BA in Economics from Princeton University.

Robin C. Newton, MD, FACP, is the Associate Senior Vice President for Clinical Affairs and Quality at Howard University, where she is responsible for professional management and oversight for the quality of the full range of clinical, educational, research, and administrative activities attendant to the Howard University Health Sciences Enterprise, inclusive of the Howard University Hospital. In addition, she has oversight responsibility for the student health program and the full complement of postgraduate residency training and fellowship programs. Dr. Newton serves on the Institutional Review Committee of the Accreditation Council for Graduate Medical Education and completed a 3-year term on the Group on Resident Affairs Steering committee of the Association of American Medical Colleges. Dr. Newton received her medical degree from Howard University College of Medicine in 1983. After completing her residency in internal medicine, she joined the staff at D.C. General Hospital, where she spent several years teaching medical students and residents. During her 18-year tenure at the hospital, she assumed many leadership positions culminating in being named Chief Medical Officer. In 2010, she was appointed the Associate Senior Vice President for Clinical Affairs & Quality at Howard University College of Medicine.

John J. Norcini, PhD, is President and CEO of the Foundation for Advancement of International Medical Education and Research (FAIMER®). FAIMER has a database of recognized medical schools around the world, an active research program on international medical education and physician migration, and fellowship programs designed for faculty from medical schools in developing countries. For the 25 years before joining the Foundation, Dr. Norcini held a number of senior positions at the American Board of Internal Medicine. His principal academic interest is in the assessment of physician performance. Dr. Norcini has published extensively, lectured and taught in many countries, and is on the editorial boards of several peer-reviewed journals in educational measurement and medical education.

Lawrence M. Opas, MD, is the Associate Dean for Graduate Medical Education and Professor of Clinical Pediatrics at the Keck School of Medicine of the University of Southern California and the DIO for the Los Angeles County and University of Southern California Medical Center, a safety-net institution sponsoring 54 accredited programs and 896 residents. He was a Pediatric Program Director for 25 years and has been the Chief of the Department of Pediatrics since 1990. Dr. Opas is the Immediate Past Chair of the Association of American Medical Colleges' Group on Resident Affairs (AAMC GRA) and also serves on the Institutional Review Committee of ACGME. He has lectured and consulted on graduate medical education in Japan, Thailand, and Taiwan. He also coauthored both versions of the AAMC GRA's publication "Core Competencies for Institutional GME Leaders and DIOs." He is a board-certified pediatrician and pediatric nephrologist who has had the privilege of caring for the underserved children of Los Angeles County for 35 years.

Louis N. Pangaro, MD, MACP is Professor and Chair of the Department of Medicine for the F. Edward Hebert School of Medicine of the Uniformed Services (USUHS). Dr. Pangaro's scholarly work is in the evaluation of the competence of trainees in medicine. He created "standardized examinees" to calibrate the validity of the prototype clinical skills examination of the US Medical Licensing Exam. He created a synthetic developmental framework for defining expectations of students and residents (the "RIME scheme", for reporter-interpreter-manger-educator). This conceptual alternative to the traditional knowledge-skills-attitudes paradigm has been studied for reliability and validity, and is used in many American clerkships. Since 2000, he has directed a six-day course for military GME program directors in assessing competence. He is an at-large member of the NBME and on the editorial boards of Academic Medicine and Teaching and Learning in Medicine, and is past-chair of the Research in Medical Education Conference Committee of the

GEA/AAMC. He has served as President of the Clerkship Directors in Internal Medicine (CDIM), and of the Alliance for Clinical Education (ACE), the coordinating council for eight national organizations of American clerkship directors. He has been honored by the AAMC with the Glaser Distinguished Teacher Award (2005). Dr. Pangaro received a bachelor's degree in English and his medical degree from Georgetown University.

Glenn Regehr, PhD, obtained his doctoral degree in cognitive psychology from McMaster University. In August 1993, he joined the University of Toronto, Faculty of Medicine and in 1996 he cofounded the Wilson Centre for Research in Health Professional Education, where he served until 2009 as Associate Director, Senior Scientist, and the Richard and Elizabeth Currie Chair in Health Professions Education Research. Currently, Dr. Regehr is Professor in the Department of Surgery and Associate Director of Research for the newly established Centre for Health Education Scholarship in the Faculty of Medicine at the University of British Columbia. Dr. Regehr has coauthored over 60 peer-reviewed grants, 150 peer-reviewed journal articles, 200 peer-reviewed presentations at national conferences, and 80 invited presentations around the world. He has chaired several national and international scientific committees related to education research and currently serves on the editorial boards of *Academic Medicine, Medical Education,* and *Advances in Health Sciences Education* (where he serves as an associate editor). He regularly consults for a variety of health professional regulatory bodies across Canada and the United States regarding models of continuing professional development. Recent awards include the National Board of Medical Examiners Hubbard Award (2007) and the Medical Council of Canada Outstanding Achievement Award (2008) for his contributions to the evaluation of clinical competence.

Andrea E. Reid, MD, MPH, is a graduate of Brown University, Harvard Medical School, and the Harvard School of Public Health. She trained in internal medicine and gastroenterology at Massachusetts General Hospital (MGH) and was on the faculty of Harvard Medical School until 2009. During her tenure at MGH, she co-chaired the Internship Selection Committee for the Department of Medicine, was associate director of the Multicultural Affairs Office, and served as the program director for gastroenterology. In 2005, Dr. Reid co-chaired GME2015, a task force convened by the leadership of Partners HealthCare, the integrated health system founded by MGH and Brigham and Women's Hospital. This task force was charged with developing a futuristic vision for graduate medical education at Partners. Dr. Reid is now the program director for gastroenterology at the Washington VA Medical

Center. She is the current chair of the GI Training Examination for the American Gastroenterological Association (AGA) and has served on AGA's Manpower and Training, Public Policy and Advocacy, Nominating, and Underrepresented Minorities Committees. She has also served on the Education and Clinical Research Committees of the American Association for the Study of Liver Disease and is a member of ACGME's Internal Medicine Residency Review Committee. She was recently appointed to the National Committee on Foreign Medical Education and Accreditation.

Richard Reznick, MD, received his undergraduate university education and medical degree from McGill University in Montreal. He did his general surgical residency at the University of Toronto. Since his appointment to the faculty at the University of Toronto in 1987, Dr. Reznick has been active in both colorectal surgery and research in medical education. He was also instrumental in developing a performance-based examination, which is now used for medical licensure in Canada. He ran a research program on assessment of technical competence for surgeons and supervised a fellowship program in surgical education. After serving at the University of Toronto Faculty of Medicine as Director of the Centre for Research in Education, Vice President of Education and the R.S. McLaughlin Professor and Chairman of the Department of Surgery, in 2010 Dr. Reznick was appointed as the Dean of the Faculty of Health Sciences at Queen's University and Chief Executive Officer of the Southeastern Ontario Academic Medical Organization. Dr. Reznick has received numerous awards for his work in education, including the Royal College of Physicians and Surgeons of Canada Medal in Surgery, the Association for Surgical Education Distinguished Educator Award, the National Board of Medical Examiners John P. Hubbard Award, the Daniel C. Tosteson Award for Leadership in Medical Education, the 2006 Inaugural University of Toronto President's Teaching Award, and the Karolinska Institutet Prize for Research in Medical Education. Dr. Reznick is the author of over 120 peer-reviewed publications and has given over 200 lectures to hospitals, universities, and scientific organizations around the world.

George F. Sheldon, MD, FACS, a graduate of the Kansas University School of Medicine, was Fellow in Internal Medicine at the Mayo Clinic, Resident in Surgery at the University of California-San Francisco, and Fellow in Surgical Biology at Harvard Medical School. He was Professor of Surgery and Chief of the Trauma Service at the University of California-San Francisco prior to becoming the Zack D. Owens Professor and Chairman of the Department of Surgery at the University of North Carolina at Chapel Hill. Dr. Sheldon is one of a small number of individuals over the

past 100 years to serve as president or chairman of all of the major national surgical organizations: the American College of Surgeons, the American Surgical Association, the American Association for the Surgery of Trauma, and the American Board of Surgery. He is a member of the Institute of Medicine of the National Academy of Sciences. He was a Charter Member of the Council on Graduate Medical Education (COGME) when it was founded in 1985 under the Department of Health and Human Services. Dr. Sheldon holds Honorary Fellowships in the Royal College of Surgeons of Edinburgh, the Royal College of Surgeons of England, the Association of Surgeons of Great Britain and Ireland, the European Surgical Association, the British Columbia Surgical Association, and the Colombian Surgical Association. He is an Honorary Fellow of the Society of Black Academic Surgeons. In 2000, he received the Kansas University School of Medicine Distinguished Alumna Award. In 2001 he was recognized by the North Carolina Chapter of the American College of Surgeons, as Honored Surgeon. In 2001 he was awarded the University of North Carolina Medical Alumni Association's Distinguished Faculty Award. In 2003 he was awarded the Distinguished Service Member by the Association of American Medical Colleges. In 2008, he was honored with a Distinguished Alumni Award from the College of Arts and Sciences of The University of Kansas. Dr. Sheldon is currently a member of the Faculty Council of The University of North Carolina at Chapel Hill and the Faculty Assembly of the University of North Carolina system. He is Editor-in-Chief of e-FACS.org, the Web portal of the American College of Surgeons, as well as Director of the American College of Surgeons Health Policy Research Institute. In January 2010, Dr. Sheldon published his newest book, entitled *Hugh Williamson: Physician, Patriot, and Founding Father*.

David P. Sklar, MD, is Associate Dean for Graduate Medical Education at the University of New Mexico Health Sciences Center and Distinguished Professor of Emergency Medicine at the University of New Mexico School of Medicine. Dr. Sklar received his medical degree from Stanford University. He has authored or coauthored more than 120 peer-reviewed articles in the areas of medical education, patient safety and quality, injury prevention, international health, and clinical care. He also published a book, entitled *La Clinica*, in 2008 concerning international humanitarian work. At a national level, Dr. Sklar has served as president of the Council of Emergency Medicine Residency Directors and the Society for Academic Emergency Medicine and chair of the board of directors of the American College of Emergency Physicians and the Emergency Medicine Foundation. He currently serves as Associate Editor for *Academic Medicine* and for the *Annals of Emergency Medicine*. Dr. Sklar's current interests are integrating medical education and clinical practice to improve clinical quality and patient safety.

George E. Thibault, MD, became the seventh president of the Josiah Macy, Jr. Foundation in January 2008. Immediately prior to that position he had been Vice President of Clinical Affairs at Partners Healthcare System in Boston and Director of the Academy at Harvard Medical School. He was the first Daniel D. Federman Professor of Medicine and Medical Education at Harvard Medical School, where he is now Federman Professor, Emeritus. For nearly four decades at Harvard, Dr. Thibault played leadership roles in many aspects of undergraduate and graduate medical education, including the New Pathway Curriculum and the new Integrated Curriculum reform. His research has focused on the evaluation of practices and outcomes of medical intensive care and variations in the use of cardiac technologies. Dr. Thibault serves on the President's White House Fellows Commission, and he chaired the Special Medical Advisory Group for the Department of Veterans' Affairs. He has been a visiting scholar at the Institute of Medicine and at Harvard's Kennedy School of Government and at many medical schools in the United States and abroad. He is a member of the Institute of Medicine.

Patricia L. Turner, MD, FACS, is a minimally invasive and laparoscopic surgeon at the University of Maryland Medical Center and an associate professor of surgery at the University of Maryland School of Medicine. She also serves as the program director for the general surgery residency and medical director of the Surgical Acute Care Unit. Dr. Turner received her undergraduate degree from the University of Pennsylvania and her medical degree from the Bowman Gray School of Medicine at Wake Forest University. Dr. Turner's current research interests are associated with her clinical expertise in laparoscopic surgery, including developing new training paradigms for residents and more senior surgeons. She has also emerged as an innovator in quality improvement and outcomes research. She has been published widely on topics related to minimally invasive surgery, quality improvement, surgical outcomes, and graduate surgical education. In her roles as a member of the Surgery Residency Review Committee, the Blue Ribbon Committee on Surgical Education of the American Surgical Association, the AMA's Council on Scientific Affairs, and the Association of Academic Surgery's Ethics Committee, she has helped to develop policy on biomedical research, training, and refining the way in which surgeons are trained. Additional leadership roles in national organizations include her current position as Speaker of the AMA Young Physician Section. She has anchored and provided ongoing medical expertise and commentary for health-related segments on Good Morning America and GMA Health and was featured in the May 2008 issue of *Black Enterprise* magazine focusing on innovative physicians. She is Chair of the UMMC Executive Infection Control Committee and the ACS-NSQIP Surgeon Champion.

Debra Weinstein, MD, is Vice President for Graduate Medical Education at the Partners Healthcare System, where she is responsible for overseeing more than 200 graduate medical education programs with 2,000 residents and fellows. Dr. Weinstein serves on the Board of Directors of the ACGME, and of the MGH Institute for Health Professions (an independent graduate school for health professions education). She is Chair of the Massachusetts Medical Society's Publications Committee, which advises the *New England Journal of Medicine* and *Journal Watch* publications. Dr. Weinstein previously served as a Program Director in internal medicine, Chair of the Association of American Medical Colleges' Group on Resident Affairs, and as a Fellow of the American Council on Education. She is a recipient of the ACGME's Parker Palmer Courage to Lead Award. Dr. Weinstein is a graduate of Wellesley College and of Harvard Medical School, where she is an Assistant Professor of Medicine. She maintains a limited practice in gastroenterology.

James O. Woolliscroft, MD, serves as Dean and the Lyle C. Roll Professor of Medicine at the University of Michigan Medical School. He is an internationally recognized scholar and medical educator who has played major roles in medical student, resident, and fellow education at the University of Michigan and nationally. His research interests in medical education have resulted in numerous publications, invited presentations, and visiting professorships across the United States and internationally. Dr. Woolliscroft was selected as the first Josiah Macy, Jr. Professor of Medical Education, an endowed professorship awarded through a national competition in 1996. In January 2001, he received a second endowed professorship, the Lyle C. Roll Professor of Medicine in recognition of his work in enhancing the practice of medicine through education. His other honors include the Society of General Internal Medicine's Career Achievement in Medical Education Award and the Educational Affairs Merrel Flair Award from the Association of American Medical Colleges.

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