The US Health Provider Workforce

Determinants and Potential Paths to Enhancement

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MERCATUS WORKING PAPER

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Jeffrey S. Flier and Jared M. Rhoads. "The US Health Provider Workforce: Determinants and Potential Paths to Enhancement." Mercatus Working Paper, Mercatus Center at George Mason University, Arlington, VA, 2018.

Abstract

The health provider workforce is an important contributor to public health. Its characteristics are shaped by factors that collectively influence the education, training, licensing, and certification of physicians (doctors of medicine and doctors of osteopathic medicine) and allied health professionals (nurse practitioners and physician assistants). Control is influenced through professional organizations that have interlocking and often obscure governance relationships within a state-based licensing system. Here we argue that although the workforce has adapted to changes in the healthcare environment, it has been insufficiently responsive to current needs and future opportunities, including those made possible by new technologies. This lack of responsiveness reflects the complex, nontransparent, and cautious nature of the controlling organizations and the economic interests of the organized professions, which tend to seek protection from competitors both local and international. By revealing the organizational complexity and interests of this critical ecosystem and suggesting areas ripe for change, we encourage enhancements of the workforce to benefit public health.

JEL codes: I, I1, I18

Keywords: healthcare, health providers, medical education, allied health providers, medical licensure, international medical graduates, healthcare workforce, scope of practice

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This paper can be accessed at https://www.mercatus.org/publications/us-health-provider-workforce.

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Overview

Despite per capita expenditures exceeding those of any other country, the US healthcare system has problems with access, cost, and quality. These deficiencies have proven refractory despite the efforts of policy experts and politicians and the desires of an increasingly concerned public. This unfortunate outcome has many contributing causes, and the most effective paths to addressing them continue to be vigorously debated. Today, most policy discussions focus on health insurance coverage and approaches to increasing coverage by expanding government insurance, subsidizing private insurance, and mandating the purchase of coverage, or more drastic reforms such as making the government the sole payer for (or even provider of) healthcare.

As important as these debates about insurance coverage are, and however healthcare is ultimately paid for, other factors—equally essential to a healthcare system capable of providing accessible, cost-effective, and high-quality care—are much less often discussed. These are the factors responsible for educating, licensing, and credentialing the physicians and other healthcare professionals who provide care and promote health through their relationships with patients. While the health provider workforce is strongly influenced by insurance and payment systems and the institutional arrangements flowing from them, some of its determinants are, at least in part, independent of these "demand side" influences. These independent determinants include the laws, regulations, and organizations that together determine the number of providers, their required programs of education and clinical training, and the paths to licensure and credentialing.

Changing the US approach to training and credentialing physicians and other providers is not an easy task. The identity of the current health provider workforce is deeply rooted in the history of the health professions, influenced by cultural, legislative, and regulatory factors that largely evolved (and are maintained) behind the scenes. The complex operations of these influences are poorly understood by the public and even by many system participants. While the organizations responsible for current practices universally state their missions and policy choices as being for the public good, many are also influenced—consciously or not—by their own interests.

The goal of this paper is to pull back the curtain and provide the context needed to have an informed discussion about how potential changes to the health provider workforce could improve the US healthcare system. We first examine several "meta issues" related to the identity of the health professions, how we might judge the adequacy of the workforce, and the role of the profession in self-regulating its numbers and functions. We then delineate the universe of institutions and organizations that together shape the current US healthcare workforce. To understand the training and credentialing of health providers, we must understand the distinct roles of these organizations and the interactions between them. Our greatest emphasis is on physicians, but allied health professionals—whose roles in healthcare have been increasing and will likely continue to increase in the future—are also considered. Finally, we explore the role of new technologies on the future health workforce and the impact of changing insurance and payment systems on future developments.

While the ecosystem that produces health providers responds to powerful incentives provided by payment and insurance systems, the causal sequence could be reversed. Reforms to the supply of physicians and other providers could help drive reform of the healthcare system writ large, assuming that insurance and regulations do not actively thwart these developments.

Reforms to accelerate innovation in the health provider workforce should not await changes in payment and insurance systems, even though these are important; efforts directed at the workforce are necessary and justified today.

The historical circumstances in which the health professions arose differ dramatically from those of today. Though the health workforce has surely evolved, we believe that evolution has been slower and more guarded than was possible and desirable; the reasons for this should be an important topic for future research and discussion. Having set the historical context, we consider approaches to accelerating reforms to the health provider workforce. Some may be accomplished easily in the short run, while others will likely require more fundamental reconsideration of our approach to healthcare and the healing professions.

Meta-Issue I: What Are "the Health Professions"?

The history of medicine includes numerous healing traditions arising within distinct cultures, from ancient Babylon, Egypt, Greece, India, and China, to Italy, France, and other European cultures, and eventually to America. These historical healers and physicians, despite humanistic intent, had very limited capacity to enhance health and many opportunities to worsen it because a scientific basis for medical practice was lacking. With the emergence of a scientific basis for medicine in the 19th century, "physicians" with diverse forms of training and experience were joined by self-trained barber-surgeons, apothecaries, drug peddlers, and many charlatans to encompass a broader health provider workforce.

Continued expansion of the scientific underpinnings of medical practice in the late 19th and early 20th centuries brought about efforts to modify and formalize medical education and to professionalize medical practice. These efforts aimed to assure the public that practitioners were properly trained and to enhance the standing of the profession (Starr 1982). It was largely from

such understandable motivations that the current approach to accrediting medical education, and to professional licensure and certification, arose.

The benefits of such an approach can be limited by several factors. Healthcare is being transformed by new knowledge at an unprecedented rate, enabling novel approaches to assessing and applying that knowledge to promote health. The current system for standardizing and certifying the profession may now inadvertently impede innovation that might allow the profession and the public to take full advantage of new knowledge and capacities. Furthermore, tensions exist between a system designed to enhance public welfare through high professional standards and one that operates to enhance the standing of the profession and protect it from unwanted competition, even at the cost of potentially beneficial change (Starr 1982).

The health professions evolve in at least two ways: (1) by changing the identity and approaches of an existing profession over time, and (2) by establishing new health professions to meet needs and opportunities inadequately addressed by the existing profession. There are several notable examples. Osteopathic medicine began as an offshoot of the medical profession in Philadelphia in the mid-19th century. Its founder objected to medicine as taught and practiced at the time, and he established a school with new elements (physical manipulation) not accepted (then or now) by the profession. Over recent decades, osteopathic medicine has further evolved to be a branch of medical practice; practitioners are doctors of osteopathic medicine (DOs). DOs undergo very similar training and licensing as medical doctors (MDs) in all 50 states, and osteopathic medicine has grown rapidly, now comprising 8.5 percent of the physician workforce. The modern nursing profession also began in the 19th century; it too continues to evolve, both in educational paths and opportunities for specialized training. Today, large numbers of nurse practitioners (NPs) engage in independent practice with the ability to prescribe medications and

bill for their services. Physician assistants (PAs), a profession created in the 1960s, mainly function today within teams of providers, augmenting the function of physicians. PAs may evolve toward greater independence in the coming years.

Given the challenges to the overall US system today, and despite new categories of providers that have arisen, it is likely that further transformation will be beneficial. Some change will occur through further evolution of physicians, NPs, and PAs and the ways in which they function together as "interprofessional" teams. We might also imagine creation of completely new training paths and types of providers, perhaps designed to take better advantage of new technology, especially if existing professions fail to do so. Existing professions may not be the most likely creators of such novel types of practitioners and, indeed, may find reasons to resist their development.

Meta-Issue II: Assessing the Adequacy of the Medical Workforce

Assessing the adequacy of the physician workforce, or the health provider workforce more broadly, presents many analytic challenges. Over the past 30 years, expert opinion has swung from predictions of physician surplus to predictions of shortage. In this section we review several factors contributing to these assessments and the resulting disagreements about them.

Several quantitative measures are commonly employed to assess current workforce adequacy, especially comparisons across geographical areas and countries; each is subject to methodologic issues, disputes about data validity, and relevance to specific subsets of patients. One simple indicator is the number of licensed physicians per population. In a comparison of 11 industrialized nations, the United States had the second fewest at 2.5 physicians per 1,000 population, compared to a mean of 3.1 for the group and high of 4.2 for Norway (Grover, Orlowski, and Erikson 2016, 11–19). Another common metric is average wait time for

appointments. Whatever their accuracy or implications, these data vary by specialty, location, type of insurance coverage, and other factors. Access to physicians will likely always be less in rural areas compared to urban settings. Overall, average wait times for a family physician of 19.5 days (Gudbranson, Glickman, and Emanuel 2017, 1945–46) are longer than many view as desirable in the United States.

In contrast, another approach takes the number of physicians, projects a reasonable number of visits per physician per day, and concludes that there are more than enough physicians to accommodate patients in the United States if care were efficiently organized (Gudbranson, Glickman, and Emanuel 2017). Unfortunately, it is not.

There are also many efforts to predict future workforce adequacy. These efforts highlight tensions among factors influencing supply of providers, expected demand for services, and factors related to clinical practice efficiency. Such projections make many assumptions and employ disparate models. Another major input to future projections is demographics. The population is aging, and as it ages, more care per person will be needed on average. Physicians as a group are also aging, with 27 percent of licensed physicians over age 60. Both retirement and burnout may influence future physician supply. For many reasons, physicians as a group are also working fewer hours, and although this is true for both men and women, women physicians work fewer hours than men on average, and as their share of the workforce is increasing (32 percent today, 46 percent of current trainees), total available physician hours will fall. Additionally, the Medicaid expansion under the Affordable Care Act has increased demand for care by extending coverage to millions of previously uninsured individuals. Taken together, these factors suggest increased physician shortages in the future. On the other hand, some projections attempt to factor in future changes to the financing and organization of care; changes promoting team-based care

might increase provider efficiency. However, to the extent these changes fail to materialize, are delayed, or fail to produce the desired effects, projections based on them will be in error.

Another issue that intersects with discussions of workforce adequacy is the question of "physician-induced demand" (Reinhardt 1985, 187–93). From this perspective, asymmetry of information between patient and provider permits (some) physicians, against an idealized view of their professional ethics, to recommend medical testing and procedures more aligned with their personal economic gains than with the needs of their patients. Although physician-induced demand certainly exists, its prevalence is debated (Rosenbaum 2017, 2392–97). To the extent that it exists, which to some extent it surely does, one could be concerned that increasing the medical workforce, in some fields and localities, could promote inappropriate rather than beneficial care.

Several other factors that might affect workforce projections are also worth noting. These include (1) increased numbers and scope of practice of nonphysician providers, such as NPs, PAs, and others; (2) new venues for delivering care, such as retail clinics at CVS, Walmart, and other establishments; and (3) increased use of technologies including telemedicine, physiologic sensors, and various mobile health apps.

The Association of American Medical Colleges (AAMC) is the organization whose workforce projections—though they have varied widely over past years—carry the most weight. Their most recent report predicts nationwide shortages of 46,000 to 90,000 full-time-equivalent (FTE) physicians by 2025—smaller than previous projections, but still substantial (Dall et al. 2015). Because so many factors influence such projections and changing them is complex and unpredictable, healthy skepticism about the accuracy and implications of current projections is justified.

Meta-Issue III: Self-Regulation of the Medical Profession

An important issue recurring through this paper is the role of the medical profession (as opposed to forces external to it) in controlling the identity, size, and function of the medical workforce. Understanding this issue requires consideration of what being a "profession" implies, a topic of interest to sociologists and historians that can be considered only briefly here. As noted by Starr, sociologists see a profession as "an occupation that *regulates itself* through systematic, required training and collegial discipline; that has a base in technical, specialized knowledge; and that has a service rather than a profit orientation, enshrined in its code of ethics" (Starr 1982). Additional attributes of a profession include the authority it possesses (whose several elements are reviewed by Starr), claims to autonomy and sovereignty of its professional judgments, group solidarity, and high ethical standards. Through these attributes a profession acquires status and prestige, financial rewards, and power, including substantial control over its own members; these may lead it to acquire a grant of monopoly from the state and on occasion to behave as a cartel.

As the medical profession has evolved over the past century, so has the manner in which it is regulated through interactions with the state and its regulatory powers. The most visible locus of this control is exerted through state licensing and disciplinary mechanisms. Through licensing flow additional loci of control by the profession, including accreditation of undergraduate and graduate medical education, specialty certification, and rules controlling opportunities for internationally educated physicians to become licensed to practice. Details of these functions have varied over time and are subject to change.

A key issue is the extent to which the organized medical profession has been given the power to control key pathways and decisions. Importantly, the public, and many in the

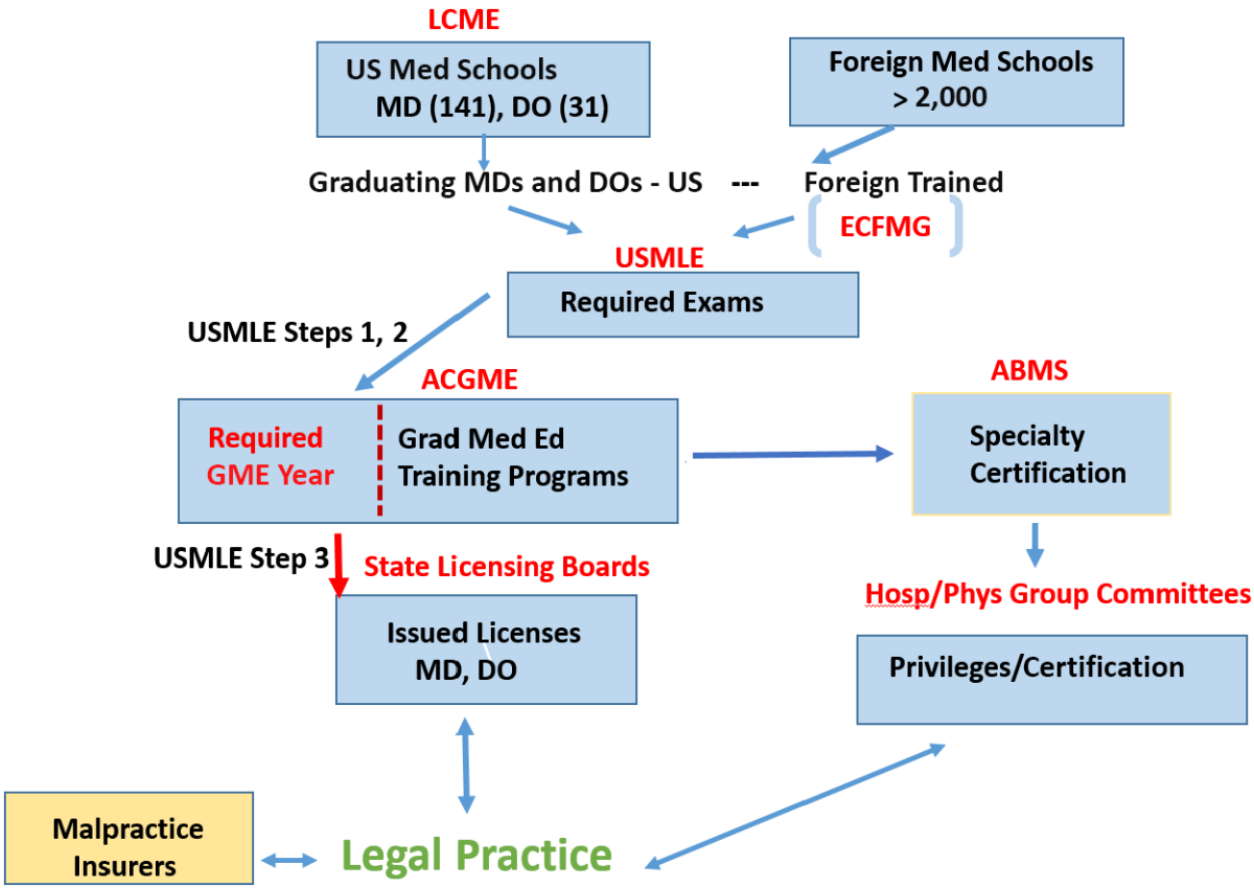
profession and policy world, have difficulty understanding how these influences are exerted today. That is largely because the myriad organizations that now perform distinct controlling functions are complex in their operations and governance, and they are generally nontransparent. The web of interactions through which these organizations operate makes it hard to assign accountability and, in turn, makes it difficult to engineer change, incentivize innovation, and determine whether decisions reflect the interests of the profession or of the public. One purpose of this paper, therefore, is to clarify the roles and interests of these organizations as well as how the organizations interact.

Finally, with enhanced capacity to obtain and share health-related information today, many individuals seeking healthcare may be less willing to cede the autonomy and sovereignty of their medical decision-making to the profession. How this will play out in the realm of professional regulation and health law is another important question.

The Key Institutional and Professional Actors

The health provider workforce in the US is shaped by many institutional and professional actors, each of which plays an important and influential role. These organizations and the relationships among them are depicted in figure 1, and their major roles are briefly described as follows.

Figure 1. Key Influences over the Health Provider Workforce in the US



Notes: LCME = Liaison Committee on Medical Education; ECFMG = Educational Commission for Foreign Medical Graduates; USMLE = United States Medical Licensing Examination; ACGME = Accreditation Council for Graduate Medical Education; ABMS = American Board of Medical Specialties.

Source: Generated by the authors.

- **State licensing boards**—To legally practice, physicians must be licensed by the states. We review their remit, how they function, and what they do or do not assure about licensed physicians to the public.
- **US medical schools, allopathic and osteopathic**—These are the main providers of new physicians (MD and DO) in the United States. We review how they are accredited by the LCME and how they may evolve to meet the needs of the public for physicians.

- **Foreign medical schools**—Graduates of foreign medical schools make up 25 percent of the physicians practicing in the United States. We review the paths for foreign med school graduates to be approved to practice in the United States, overseen by ECFMG, and examine whether the approach can be improved to benefit US health consumers and foreign-trained physicians.
- **Graduate medical education (GME)**—After graduation from medical school, one year of graduate education is required for licensing, and most physicians do multiple years of additional training as residents in specialties and subspecialties. We review how this process is overseen by the ACGME and related specialty boards.
- **Certification of physicians (and other providers) by hospitals, health systems, and physician groups**—This process is likely the most in-depth assessment of physician skills and competence. It could be modified to assess new care providers and approaches to providing care, and to facilitate importing additional foreign-trained physicians.
- **Allied health professions—**Healthcare is provided not just by physicians but also by a broad array of clinicians with different levels of training and expertise, including NPs and PAs. We review the training, licensing, and scope of practice for these professionals and others.
- **The effect of new technologies**—Technology is a potential force multiplier in both medical education and medical practice. It has the potential to increase access, lower costs, and transform the way healthcare is provided. We touch on how new technologies can lead to new opportunities for change in the healthcare workforce. This factor is not included in figure 1.

Medical Licensure

To legally practice medicine, a physician must hold a valid medical license. In the United States, the authority to confer licenses is delegated to the states. Though licensing in some form was seen in the early 19th century, licensing in its current form began in the early 20th century. The medical profession has evolved dramatically since then, and the role of licensure, although still important, has become less central to the overall regulation and function of the profession. In this section, we describe the core elements of the licensure system and what it seeks to accomplish; what issues it may address poorly; and how it may on occasion operate to protect the interests of the profession over those of patients.

The Function of State Boards

State boards of licensure, established by statute, set the standards for licensure in each state, positioning themselves as gatekeepers to legal practice of the profession. Their first role is largely administrative. They check applicants' credentials, certifying that they graduated from an accredited US medical school, passed the three-step national USMLE examinations, and completed one year in a graduate medical education (GME) program accredited by the Accreditation Council for Graduate Medical Education (ACGME). State boards also run criminal background checks. Initial licensure therefore provides assurance that practitioners completed an accredited medical education program through a year of GME training, passed the USMLE exams, and lack a criminal background.

State boards investigate complaints about licensed physicians that arise from the public, hospitals, or other health organizations. They also collect information from malpractice insurers on pending and settled cases. Importantly, they function as "complaint-driven" organizations that do not conduct prospective reviews of physician behavior or quality. The vast majority of issues

that result in disciplinary action relate to physician use of drugs or alcohol, assault or inappropriate sexual behavior toward patients, or mental illness. Board staff members investigate complaints and make recommendations to the board.

Boards have long sought to keep complaints and grievances private while typically making public any final adjudicated sanctions. Compared to the number of complaints (which are impossible for the public to identify because of confidentiality and regulatory concerns), the number of final disciplinary actions is quite limited, affecting substantially less than 0.5 percent of licensed practitioners per year (Grant and Alfred 2007, 867–85; Ameringer 1999). Boards may reach settlements with providers, and these may allow continued practice, perhaps after a period of suspension, sometimes with specific limitations to scope of practice. Licenses may also be revoked. This occurred with 267 physicians in 2016 (FSMB 2016, 16). In effect, licensing boards identify and discipline the most egregious outliers in the profession, such as those suffering from impairment, incompetence, or criminality, but have little or no role in providing broader assurances of competence to the public. One study revealed that for the category of physician sexual misconduct, two-thirds of physicians who lost privileges or had malpractice claims for misconduct over a 10-year period suffered no board sanctions, suggesting deficient oversight of adjudicated misconduct by state boards (AbuDagga et al. 2016).

Several key points require emphasis. First, initial licensure is issued after medical school graduation and one year of GME training. The medical license authorizes the licensee to conduct any procedure viewed as within the scope of the medical profession. (For example, a licensed MD with one year of hospital training could in theory perform surgery, if the MD had a place to perform it, didn't claim training or certification as a surgeon, and perhaps had malpractice insurance—all quite unlikely, but not a violation of the license.) Whereas in the

past most practitioners were generalists, the ratio of specialists to GPs has risen markedly; training and certification for these specialties (and subspecialties) are completely independent of state licensure.

Scope-of-Practice Decisions

State boards also define "scope of practice" for the profession, specifying which activities and procedures are covered by the license. Scope-of-practice decisions are especially salient when applied to nonphysician providers, such as NPs and PAs. These relatively new categories of providers are overseen by their own professional organizations in conjunction with state laws. Each state has a nurse practice act (NPA) establishing a board of nursing with the power to create rules and regulations for the profession. As a check against too broad a scope of practice, rules proposed by the nurse boards undergo public review before enactment by the state. The growth in NP scope of practice has often become a matter of dispute (Donelan et al. 2013, 1898–906). Medical societies have sought to reduce NP scope of practice and independence from MD supervision by opposing NPs' efforts directly or insisting on jointly drafting changes to regulations (Iglehart 2013, 1935–41). In contrast to NPs, PAs are typically licensed by state medical boards. Though independence from MDs conflicts with the very name of the profession, such independence could be a future direction for the profession.

The official remit of state boards is to *protect the public's health* through licensure, discipline, and general regulation of the profession. They function independently within the state hierarchy or within an umbrella state health agency such as a department of health. Formerly populated with physicians alone (and at one point the direct responsibility of medical societies) (Starr 1982), since the mid-1960s most boards have both physicians and lay community

members. Membership is typically chosen through a state government process; political considerations, including the influence of medical societies, play a role.

State Boards as a Potential Anticompetitive Mechanism

Although this role is not articulated in mission statements, licensing boards may also function to protect the profession against competition from alternative providers, especially those capable of producing economic losses to the incumbents. For instance, in the early part of the 20th century, organized medicine relied on state boards to deter chiropractors from practicing (Ameringer 1999). The modern history of organized medicine reveals many efforts to limit competition, including opposition to salaried practice, advertising, provision of prepaid healthcare services, competition from nonphysician providers, and most recently, efficient application of telemedicine (Starr 1982). Such efforts may be exercised through legislation, decisions of state licensing boards, or threat of legal action. Recently, dentists in North Carolina who controlled the North Carolina Board sued proprietors of small teeth-whitening businesses for "the unlicensed practice of dentistry" (Sage and Hyman 2016, 723). Regulatory capture is a form of government failure which occurs when a regulatory agency, established to serve the public interest, instead advances the commercial or political concerns of special interests that dominate the industry it is supposed to regulate. Regulatory capture is a known dynamic of many professions (Dal Bó 2006, 203–25), and medicine is no exception. Organized medicine has sought to keep medical boards subordinate to state medical societies, for instance, by controlling the selection of board members and becoming involved in staffing and management. Co-optation of state boards by professional interests is an issue to be guarded against.

The public desires protection from charlatans, sociopaths, incompetents, and crooks, and state licensure is one major mechanism established to achieve that goal. But licensure may also

limit innovation in the physician workforce. In many industries, the path to innovation and disruption involves transitioning from more highly trained workers to those less highly trained, or differently trained, permitting more routinized approaches when appropriate, and thereby obtaining greater access and lower cost (Christensen, Grossman, and Hwang 2009). Such evolution benefits from flexibility in use of providers, based on local knowledge about their competencies. In contrast, paths stipulated through licensure adopt change more slowly because of inherent regulatory conservatism and special-interest rent-seeking, in which participants seek to increase their share of existing wealth without producing new wealth, thereby reducing economic efficiency. In the following section, we compare the role played by licensure in consumer protections to that provided by other organizations, such as specialty boards, hospitals, and health systems.

Accreditation of Allopathic and Osteopathic Medical Schools

To grant medical degrees, US medical schools must be accredited by either the Liaison Committee on Medical Education (LCME) for those granting the doctor of medicine degree or the Commission on Osteopathic College Accreditation (COCA) for those granting the doctor of osteopathic medicine (DO) degree. In this section, we describe the system for accrediting medical education and explore reforms to improve it.

Medical schools are strongly influenced by the accreditation process. Both the LCME and the COCA comprehensively review the organizations, including curriculum, administration, faculty, staff, students, and facilities. Reviews occur every eight years and take several years to complete. They are sufficiently consequential that institutions begin preparations several years in advance, many engaging consultants to advise them.

A major requirement is generating a comprehensive self-examination and assessing its compliance with extensive accrediting standards. The standards include many process measures, such as hours spent in specific training activities, as well as the state of administrative and financial operations. The self-examination is followed by visits by representatives of the accrediting body. If discrepancies or shortcomings are discovered vis-à-vis the published standards, the institution must draft a plan for remediation. Institutions may be put on probation until such issues are resolved.

Strictly speaking, accreditation is voluntary. A medical school *could* choose to forgo accreditation and still enroll students. However, to obtain a physician's license, an individual must take the United States Medical Licensing Examination (USMLE), an extensive multiday test sponsored and controlled by the Federation of State Medical Boards (FSMB) and the National Board of Medical Examiners (NBME). To sit for this exam, one must have graduated from an LCME-accredited school (or a DO school accredited by the American Osteopathic Association, or a foreign school that meets ECFMG criteria). Accreditation is also required for students to receive federal loans. Accreditation is thus a de facto government requirement.

Historical Roots of Accreditation: The Flexner Report

The current approach to accrediting medical education traces back in part to the Flexner Report of 1910. Named after Abraham Flexner, who led the work, and commissioned by reformers within the American Medical Association, with the assistance of the Carnegie Foundation, the report proposed raising admission and graduation standards for medical schools. Before that point, standards were nearly nonexistent, and the curriculum consisted almost exclusively of lectures with little to no opportunity for dissection or actual clinical work. In the mid-19th century, Harvard Medical School had no admissions requirements and a two-year curriculum

with few, if any, exams. Harvard University President Charles William Eliot, a chemist, wrote in 1870, “The ignorance and general incompetence of the average graduate of American Medical Schools at the time when he receives the degree which turns him loose upon the community, is something horrible to contemplate. The whole system of medical education in this country needs thorough reformation” (Starr 1982, 113). Schools lacked both standards and coherent educational approaches, and many were accurately described as fraudulent “diploma mills.”

The Flexner Report was highly influential in accelerating changes to this reality. Over several years, it set in motion transformation of curricula to a “2-plus-2” approach, with two years of preclinical and two years of hospital-based education, after completion of a baccalaureate degree. Flexner argued strongly that medical schools should be part of universities rather than freestanding entities, with medicine seen as graduate training. While these changes conferred many benefits, reflecting the evolution of medicine from a field with little understanding of disease and few effective therapies to one with a more scientific base, the Flexner Report, along with changing economics of practice, accelerated the shuttering of many medical schools (more than one-third of those in existence). The shuttered schools disproportionately served African Americans and women, groups not admitted to most other schools at the time.

Medical school accreditation standards became both a means to standardize and enhance the quality of the profession and a lever to control the supply of physicians and the nature of their education. Whatever the benefits, one could predict the consequences of organized medicine being given total control over defining what a physician is and how he or she must be educated. With such concentrated monopoly power, the educational model was subject to less competition and thus experienced less experimentation and innovation. Several years after his report, Flexner

expressed disenchantment with the rigidity of medical education that became identified with his name (Starr 1982, 128). More recently, a report issued by the Carnegie Foundation on the 100th anniversary of Flexner's report called for major changes in medical education from ideas advocated by Flexner, in response to new realities in education and medicine (O'Brien and Irby 2013, S1-8).

The dynamic between medical schools and LCME accreditation raises several important issues. Much is at stake during a review, so schools spend enormous effort to understand what the LCME wants, and doesn't want, in the hope of emerging from reviews free from identified deficiencies. This reduces the desire for experimentation and innovation, which are risky and may not be well received by accreditors. Some, but very few, schools have managed to experiment with new curricular approaches (Loftus, Willoughby, and Connolly 1997, 248–53; Cangiarella et al. 2017, 483–90). For example, the University of Missouri–Kansas City has a six-year integrated MD program with entry after high school (UMKC 2017), much like the standard approach in Europe and elsewhere in the world. Two Canadian schools and several in the United States now have three-year postbaccalaureate MD programs (Abramson et al. 2013, 1085–88). There are likely many reasons—including loss of tuition revenues—that such approaches are uncommon in the United States. Some critics contend that they may work well for exceptional students capable of an accelerated pace of learning but would not suit the average student (Goldfarb and Morrison 2013, 1087–89). Whether such programs would lead to a major change in medical education or a relatively minor one, the current high-stakes accreditation process does not invite the kind of large-scale experimentation that could lead to improvement.

A recent conversation with a senior official of the LCME revealed that they are aware of problems in the dynamics of accreditation reviews. The LCME is seeking to change the culture

from one of "what do I need to do to be accredited?" to "what kind of a school do I want to be, and how can I get there?" LCME leaders accept that schools with diverse goals for their graduates and approaches to educating them should exist. For example, some schools stress education of physician researchers and leaders, while others seek to produce frontline primary care practitioners. Although the LCME requires a minimum base of knowledge, educational approaches and supporting resources differ markedly between these types of schools. Both types of schools add value to society. The LCME could do a better job of clarifying its goals and expectations to further encourage diversity in goals and educational paths of accredited schools.

Accreditors Responding to Projected Physician Shortages

How do accreditors respond to concerns about current and future physician shortages? Over time, analysts (including at the AAMC) have varied their views of whether there is an oversupply of physicians (with proposed negative consequence of "physician-induced demand") (E. Johnson 2014) or current (and projected) physician shortages. While there is still debate on the question of whether an overall physician shortage exists, many agree that shortages exist in particular specialties such as primary care and in particular regions and communities, and that these will likely increase due to demographic and other factors (Petterson et al. 2012, 503–9; Salsberg 2015, 1210–14). In response, the AAMC has encouraged opening new medical schools and expanding class size. As a result, the number of MD graduates in the United States will increase from 16,488 to 22,200 (projected) between 2002 and 2021. Graduates of DO schools have risen even more dramatically, from 2,968 to 8,700 over the same interval.

The increase in physician supply leaves several important questions unanswered. First, will it adequately address the projected shortage in numbers, specific specialties, and

geographical distribution? Most observers think not, though this remains a topic of debate (Gudbranson, Glickman, and Emanuel 2017, 1945–46). The expansion of medical school enrollment from 2002 to 2016 increased the number of physicians produced, but the proportion of graduates going into internal medicine, pediatrics, and family medicine residencies has not changed (Dalen and Ryan 2016, 1241–43). Though many choices of specialty and mode of practice are made after graduation and have several inputs, the way we educate physicians can affect these choices. Some medical schools are testing new ideas designed to incentivize more students to go into primary care. For instance, Texas Tech University Health Sciences Center developed the Family Medicine Accelerated Track, an MD curriculum with accompanying scholarship support that shortens training by one year for students who commit to family medicine (Jones and Berk 2016, 62–7). We need to better understand the educational factors and admissions criteria that influence postgraduation career decisions.

The Cost of Medical Education

Another important factor affecting career choices is the cost and duration of medical education. The debt many students take on to fund their education now averages approximately $180,000 at graduation. Tuition has been rising, with mean tuition at $55,000 per year for private schools and $35,000 per year for public schools for in-state students, and there is little incentive for schools to reduce tuition, given that the demand for positions exceeds supply. Because of the long duration of training, tuition and debt underestimate the true cost, which should also reflect years of forgone income. These costs disadvantage the less wealthy among potential students, whose representation in the physician workforce is thereby diminished.

In considering the approach to medical education in the future, it is not clear that potential benefits of reducing the cost and duration of training have been given sufficient attention by the

accrediting bodies. It is believed that graduating debt influences choice of specialty and discourages some less well-off students from considering the profession. Reducing educational costs and duration would entail tradeoffs, and the LCME has not articulated a view on what these are and how they would be adjudicated. In most of the world, graduating high school students enter six-year combined university and medical training programs. Increased use of such a pathway might be useful in the United States, where it exists in a very limited number of schools.

The Financial Models of Medical Schools

The financial models under which medical schools operate are worthy of discussion. In the pre-Flexner era, many medical schools were for-profit, "proprietary" schools, known for few or no academic standards and a willingness to produce "physicians" of little skill or competence. Students paid fees to instructors, and most schools were on the edge of insolvency. The impact of Flexner, together with economic factors, brought about closure of many such schools. Flexner opposed for-profit schools, believing medical schools should be associated with nonprofit universities. Not surprisingly, nearly all medical schools today are nonprofit entities, and as Flexner recommended, most are associated with universities through academic affiliation agreements. Many are units of state university systems.

The relationship between medical schools and the health systems required for clinical education of their students is also quite variable. Some schools and associated health systems are independent but linked through affiliations (as with Harvard Medical School and its hospitals), while others are components of the same organization, as when both are owned by a university (e.g., Johns Hopkins University, Stanford University, the University of Pennsylvania, and Duke University).

Not surprisingly, the financial structures of medical schools are also highly variable, reflecting diverse operational, fiscal, and governance arrangements. One source of revenue is, of course, tuition. Schools also need other substantial revenues to support research programs. In many schools, research has grown to be very large, with budgets often far larger than what is required to support educational programs. Apart from tuition, schools derive revenues from sponsored research grants (the majority from the National Institutes of Health), as well as gifts, endowment income, and, to a widely variable degree, funds transferred from clinical operations to support the educational and research missions of the school. For research-intensive schools, the cost of educating medical students is a small fraction of the overall school budget (e.g., education accounts for approximately 6 percent of the Harvard Medical School budget). Recent downward pressure on sponsored support of biomedical research (J. Johnson 2016) suggests that the current model of many research-intensive medical schools may not be sustainable.

More Applicants Than Openings

Despite expansion of positions, there remain many more qualified applicants to US medical schools than there are available openings. In 2016, 53,029 applicants sought 21,025 openings, with only 39 percent of applicants able to find a position, compared to 42 percent in 2006. New for-profit schools could be one route to allaying the physician shortage, assuming they could respond more rapidly to the perceived need. In this context, a very limited number of for-profit medical schools, both allopathic and osteopathic, have received accreditation in recent years (Adashi, Krishna, and Gruppuso 2017, 1209–10). Success of a for-profit business model will likely require innovation to reduce the cost of education and the ability to scale class size. Such schools would likely emphasize education of practitioners while focusing much less on

research to generate new knowledge. The potential of this model to succeed would depend on the quality of their graduates.

Accredited Schools Connected to Health Systems Rather Than Universities

Discussion with LCME leaders revealed that they see many future schools arising from integrated health systems (see the new schools at Geisinger and Kaiser) rather than universities. This would create opportunities to increase integration of health education across medical school and graduate training in health systems, and across health professions, with opportunities for efficiencies in education and care delivery (Josiah Macy Jr. Foundation 2017). These are potentially hugely consequential changes to the path for medical education. The continued support of the LCME, and the professional organizations that support it, will be critical to the success of such changes in medical education in the post-Flexner era. A recent article by several current and former medical school deans expressed concern that a "two-tiered" system of medical education might be arising (Feldman et al. 2015, 285fs17). We find this concern to be off target. It is hard to argue that a single tier exists now or that greater uniformity of educational approaches would be desirable in the future.

It is impossible to determine whether current accreditation approaches have optimized the training of highly skilled doctors, since alternative approaches to accreditation within the United States do not exist for comparison. When US medical graduates are compared to international medical graduates (who attended schools with widely divergent curricula) on residency and future performance, international medical graduates do as well as or better than graduates of LCME-approved schools, though data on this point remain limited (Norcini et al. 2014, 1157–62; Tsugawa et al. 2017, j273). Accreditation must go beyond creating uniformity and reinforcing status quo practices. It should support the efforts of schools to shift to more qualitative and

outcome-based measures of educational experience (Davis and Ringsted 2006, 305–13). Where appropriate, schools should be able to embrace innovation and experimentation to encourage the diversification of physicians and other health providers of the future.

Graduates of Foreign Medical Schools Practicing in the United States

International medical graduates (IMGs) are an essential component of the US healthcare system, representing 23 percent of physicians in practice today (approximately 240,000) and a similar percentage of physicians in graduate medical training programs. Evidence, though limited, suggests the care these physicians provide is as good as or better than that provided by graduates of US schools (Norcini et al. 2010, 1461–68). IMGs have additional advantageous attributes from a public health perspective: they are substantially more likely to practice in rural and poorer communities and are overrepresented in primary care specialties, including family medicine and pediatrics. Shortages of US physicians are predicted to increase, both in primary care and in certain specialties, like general surgery, over the coming decades (Grover, Orlowski, and Erikson 2016, 11–19). Increasing the number of quality foreign-trained physicians is one approach to addressing this projected shortage.

How is the number of foreign-educated physicians licensed to practice in the United States determined? The Educational Commission for Foreign Medical Graduates (ECFMG) was created 60 years ago to perform this function. ECFMG represents the interests of the organized medical profession, with a board including members from the American Medical Association (AMA), the AAMC, the FSMB, the ABMS, the Association for Hospital Medical Education (AHME), and the National Medical Association (NMA). ECFMG is the designated gatekeeper for IMGs who wish to become licensed in the United States. It certifies a valid diploma from a

medical school registered in the World Directory of Medical Schools. There are about 2,600 such schools (Duvivier et al. 2014, 860–69).

Graduates of medical schools outside the United States or Canada who wish to be licensed to practice in a state in the United States must complete a number of steps, each requiring interaction with ECFMG. (See table 1.)

Table 1. Steps for Graduates of Medical Schools outside the United States or Canada to Become Licensed

Steps and Details
1. The applicant must apply for and pay a fee to ECFMG.
Before anything else can happen, the individual must become certified to go through the process.
2. The applicant must pass the first two steps of the United States Medical Licensing Exam (USMLE).
ECFMG certification is required to be eligible to take these exams.
3. The applicant must gain admittance to a US residency program.
ECFMG certification is required for an IMG to enter the residency Match. In 2014, 26,678 first-year residency positions were offered in the Match (ECFMG 2017). Competing for these positions were 17,324 allopathic graduates and 2,738 osteopathic graduates (apart from approximately 4,000 applying to osteopathic hospitals). There were 7,334 non-US-citizen IMG applicants and 5,133 US-citizen IMG applicants (together equaling 12,467 IMG applicants). The 5,133 IMG applicants who are US citizens arise largely from the pool of 23,000 US citizens who applied but were not accepted to US schools. Approximately 50 percent of all IMG applicants to the Match are accepted to residency positions, compared with 95 percent of graduates of US allopathic schools who successfully match for US residency positions (ECFMG 2017). In 2014, it is estimated there were 9,326 IMGs eligible to start a residency (based on ECFMG certification) who had not matched with a residency. Overall, there may be as many as 60,000 unlicensed IMGs in the United States (Young et al. 2011, 10–20). Most take other jobs, both as nonphysician health providers and in a wide array of other positions outside of healthcare, though detailed data are hard to find. Graduates of international schools who are not US citizens must obtain a visa to start their GME training, with sponsorship by ECFMG. Graduates of foreign schools who *are* US citizens are 30 percent of the 10,000 ECFMG-certified IMGs per year; most of these US citizens graduate today from Caribbean schools (ECFMG 2015).
4. The applicant must pass Step 3 of the USMLE.
Pass rates in 2015 for first-time takers of the Step 3 clinical skills exam (taken at the end of the first GME year) were 96 percent for graduates of US and Canadian schools and 80 percent for IMGs (82 percent for US citizens and 78 percent for foreign citizens). Whether the modestly lower pass rate for IMGs represents the quality of the pool of students, the quality of their education, or other factors is not known. Once IMGs have been ECFMG certified, have completed one year of GME, and have passed USMLE Step 3, they are eligible for state licensure. The largest number of IMGs licensed in the United States graduated from schools in India (10.9 percent), Pakistan (7.7 percent), China (2.1 percent), Mexico (2.0 percent), the Dominican Republic (1.9 percent), and the Philippines (1.2 percent), but IMGs are graduates of more than 2,000 schools from more than 100 countries. A very small number of IMGs graduate from schools in wealthy, industrialized countries. The top five states for IMGs in practice are New Jersey, New York, Florida, Illinois, and Michigan, though IMGs practice in every state.

Sources: ECFMG, *Results and Data 2017 Main Residency Match*, National Resident Matching Program, April 2017, http://www.nrmp.org/wp-content/uploads/2017/06/Main-Match-Results-and-Data-2017.pdf; ECFMG, *Educational Commission for Foreign Medical Graduates (ECFMG): Annual Report*, 2015, https://www.ecfmg.org/resources/ECFMG-2015-annual-report.pdf.

Why must fully trained IMGs—those who in addition to medical school have completed advanced clinical training in their home country—be required to repeat GME training in the United States to be eligible for licensure? This requirement is a major disincentive for considering relocation, especially for those from economically advanced countries, who have smaller incentives to emigrate. ECFMG provides several answers to this question. The first is the need to ensure the quality of the "imported" IMGs and their ability to function well in an American environment without having trained here. While plausible, there is reason to question whether these concerns justify requiring physician retraining in nearly all cases. It would be preferable to create mechanisms providing evidence of competence without retraining.

From the perspective of the health and welfare of Americans, greater numbers of licensed, foreign-trained physicians of all specialties would likely be a good thing. The quality of care they provide, the specialties they practice, and the communities they serve suggest that greater numbers would be beneficial, especially for those least well served today. As one example of this recognition, the Minnesota Department of Health has developed a program to find new approaches for IMGs to be licensed to practice, especially in primary care and in rural areas, without current barriers to licensure (MDH 2017).

Some countries have modified their policies to be more welcoming to IMGs. For example, Australia has had periods in which it has been quite open to physicians wanting to relocate. In the 1990s, when the country froze medical school enrollments in order to control costs, it embraced IMGs as an approach to maintaining physician supply (McGrail et al. 2012, 133–39). Eventually, populist political forces succeeded in instituting controls such as special requirements that incoming IMGs practice in rural settings before receiving full "registration"

(license). These, however, were put in place out of a desire to protect new Australian medical school graduates from competition, not purely out of a concern for care quality. Canada is another country with a relatively open policy toward incoming IMGs. In Canada, specialists and general practitioners are on the national list of "in-demand occupations." IMGs must obtain a full or provisional license from the provincial college of medicine before they can practice, which involves retraining for some individuals. However, an IMG may bypass postgraduate training requirements if he or she did residency training in one of several jurisdictions (Australia, Hong Kong, Ireland, New Zealand, Singapore, South Africa, Switzerland, the United Kingdom, or the United States). The policy has been successful, with IMGs now constituting upward of a quarter of the physician workforce in Canada (Campbell-Page et al. 2013).

There are counterarguments to creating additional opportunities for IMGs in the United States. For example, one might raise concerns about inferior quality of IMGs compared to graduates of American and Canadian schools. But, as stated, evidence indicates that IMGs licensed through current procedures perform as well as graduates of US and Canadian schools (Tsugawa 2017, j273). A study of complaints and adverse disciplinary actions among IMGs practicing in Australia found that although doctors trained in some outside countries were at greater risk for such events, doctors trained in most outside countries were at no greater risk than those trained in Australia (Elkin, Spittal, and Studdert 2012, 448–52). If additional GME positions became available, through one or more policy efforts, to accommodate IMGs who today fail to match, future research would need to determine whether this group would also perform at an acceptable level. There might also be concerns that these physicians would compete with graduates of American schools. This argument would be based on protection of the profession from competition rather than concern for public health. Finally, there might be concern that

physician immigration would adversely affect the physician workforce of other countries. Although a potentially important consideration, there is little reason to predict a major medical "brain drain." Even so, we believe there are better approaches to addressing this concern than preventing emigration of physicians in search of a better life for themselves and their families.

Allied Health Professions

It is neither possible nor desirable for physicians alone to deliver all medical care. Appropriately, healthcare has evolved such that many health services are delegated to other clinicians with varied types of training. These clinicians are said to be part of the allied health professions. In this section, we examine how current training, licensing, and scope of practice of these professions can influence the provision of healthcare.

Allied health professionals are nonphysician clinicians trained to identify, evaluate, treat, and prevent diseases. The term includes NPs, registered nurses (RNs), PAs, physical therapists, occupational therapists, audiologists, and speech-language pathologists, among several other professions. Pharmacists are occasionally included under the allied health umbrella but are more commonly considered a category of their own.

The two professions of greatest relevance to this paper are NPs and PAs. NPs are registered nurses with advanced education and clinical training enabling them to provide a broad range of care, including primary and preventive care. They are viewed as competent to diagnose, treat, and manage diseases, as well as write prescriptions. NPs have either master's or clinical doctorate degrees. Their main professional body is the American Association of Nurse Practitioners (AANP). NPs began as a profession in 1965, and there are 240,000 licensed NPs in the United States today (AANP 2017).

PAs practice medicine in team-based settings and work under the supervision of a physician. PAs may take medical histories, conduct basic physical examinations, and interpret lab results. They provide health education to patients and their family members, as well as follow-up care. Increasingly PAs specialize in areas such as emergency medicine, surgery, or critical care. They generally have master's degrees; a small number of new programs for PA doctorate degrees have been established. The main professional body for PAs is the American Academy of Physician Assistants (AAPA). Today over 100,000 PAs are practicing in the United States.

Both NPs and PAs are nationally certified and state licensed. For NPs, there are multiple certification boards. The AANP has its own certification board, the AANPCB. Four other NP certifying bodies also exist, and they coordinate to reach consensus and adopt similar definitions of NP practice, titles, and specialties. Individuals who graduate from an accredited physician assistant program take the Physician Assistant National Certifying Examination (PANCE), created by the National Commission on Certification of Physician Assistants (NCCPA).

All US states, the District of Columbia, and US territories rely on these certification bodies for licensure and regulation of NPs and PAs. However, states determine the scope of practice for these professions. Nurse practitioners are currently authorized to practice independently without physician oversight in 21 states. In all states and DC, they are permitted to write prescriptions, although Florida restricts their ability to prescribe certain controlled substances. The scope of practice for PAs similarly varies by state. State regulations determine which medical tasks can be delegated by a supervising physician. Prescriptive authority also varies from state to state. In about half of states, NPs and PAs are under "reduced practice" or "restricted practice," requiring collaborative agreements or direct and close physician

supervision. In states with mandated supervision, NPs may have to pay physicians significant consulting fees.

By delivering accessible, high-quality, cost-effective care, NPs and PAs are a beneficial component of the healthcare system. They mitigate physician shortages, particularly in rural and underserved areas. Increasing evidence indicates that NPs and PAs perform many primary care services as safely and effectively as physicians (Horrocks, Anderson, and Salisbury 2002, 819–23). Treatment practices, prescribing behavior, and resulting health status have been found to be comparable (Venning et al. 2000, 1048–53). Patients report being satisfied with care received from NPs and PAs, and in primary care settings, tend to view them as similar to physicians. Many payers also view them positively. Both professions are eligible for certification as Medicare and Medicaid providers, and both are generally seen as cost effective across a range of primary and specialty care services, receiving favorable reimbursement from commercial payers.

Some physician groups, perhaps seeing this trend as a competitive threat, have vigorously advocated for state-level actions to limit NP and PA scope of practice or block efforts to expand scope of practice (Altman, Stith Butler, and Shern 2016). In the battle over scope of practice, there is a modest trend toward expanded roles for NPs and PAs. Geographically, much of the western United States plus most of New England allow NPs a full scope of practice, meaning they can prescribe, diagnose, and treat patients without physician oversight. Parts of the Atlantic coast and Midwest allow a reduced scope of practice, meaning NPs need physician oversight to prescribe medications. The remainder of the United States, roughly the Southeast plus Texas and California, have the most restrictive practice laws.

Apart from disagreements over scope of practice and provider independence, there are substantial opportunities to improve care delivery through interprofessional provider teams. Such

teams can tailor care to individual patient needs, with each provider contributing skills "at the top of their license" to the process. To achieve the maximal benefits of this approach will require changes in both health school curricula and the organization of care.

Currently Unlicensed Health Providers

Established health professionals are not the only individuals who can benefit the public's health; health may also be advanced by providers who are not licensed or seen as professionals today. These include health coaches, community health workers, and community paramedics, among others. Community health workers with varying levels of training and roles have been employed in many countries where physicians are few, requiring alternative approaches to promoting health (Phalen and Paradis 2015). Research suggests that in these settings they can achieve the goal of improving health of the populations they serve (Kangovi et al. 2017, 1660–67). Paramedics and EMTs are additional providers whose capabilities and roles may be expanded beyond their customary roles in emergency care and transport to provide care to those in need. As community paramedics (CPs), they may provide some primary care services, home assessment, health education, and direct services such as wound care. The American Nurses Association is working to provide some uniformity to this new group. Incentives to these new providers and elimination of regulatory roadblocks to their potential success would be a major positive development.

Graduate Medical Education

In addition to graduating from an accredited medical school and passing USMLE exams, medical licensure requires at least one year of clinical training after medical school. Since there are more combined US and IMG applicants for the residency Match than there are

accredited positions, the number of GME positions is a rate-limiting factor in licensing physicians. Beyond this minimal requirement for licensure, the vast majority of physicians pursue additional postgraduate training in diverse clinical specialties (e.g., internal medicine, surgery, and pediatrics). Many more do additional subspecialty fellowships.

What determines the number and distribution of these GME training opportunities? Today, this is determined by two major factors. First, hospitals must be willing and able to provide such training programs. Second, the training programs must achieve accreditation, both to fulfill licensure requirements and to permit certification in the areas of specialized practice, as required for hospital or physician group privileges.

The factors driving the number and distribution of GME training positions, and the role of federal funding (mainly via Medicare) in determining this outcome, have been the subject of much discussion and debate. An in-depth review is not possible here, but several points relevant to the focus of this paper will be made. First, GME training existed long before Medicare funding entered the picture in 1965. There were lower levels of compensation, but Medicare's reimbursement of hospitals for training was not absolutely required for GME training to exist. Hospital reimbursement from Medicare linked to the number of GME training positions is substantial, at $9.5 billion in 2014. These funds were established to pay for trainee compensation, the cost of educators and additional educational infrastructure, and an expected increased cost of care when less efficient trainees are involved. These new hospital payments were part of the grand bargain that facilitated Medicare and Medicaid legislation passing Congress despite opposition from the profession. These GME payments also incentivized expansion of GME programs.

The AAMC argues that despite these large financial subsidies, academic health centers lose money on physician training, but despite these losses, they support training as part of their broader social mission (Grover, Slavin, and Willson 2014, 2360–62). Others, including many economists, assert that hospitals benefit financially from GME training, since trainees enhance hospital revenues more than their level of compensation (Chandra, Khullar, and Wilensky 2014, 2357–60). Supporting the latter claim, the number of training positions continued to increase after a cap on Medicare-funded positions was put in place in 2003; this cap set the number of positions at 1996 levels, and it persists today. Nonetheless, the AAMC and other professional organizations cite the Medicare GME funding cap as the main reason GME opportunities have not expanded further (Chandra, Khullar, and Wilensky 2014, 2357–60; Grover, Slavin, and Willson 2014, 2360–62). Another topic of debate is whether Medicare GME funds should be used to address specific workforce needs, such as training more primary care physicians. Presently, GME funds are not deployed to incentivize choices for the practice of specific specialties. This is more likely the consequence of influence exerted by medical specialties to maintain the status quo than of any argument based on consequences for public health.

Role of the ACGME

When a hospital establishes one or more GME training programs, whether to achieve financial benefits or for other mission-related reasons, the programs must be accredited. The Accreditation Council for Graduate Medical Education (ACGME) is responsible for accrediting graduate medical training programs (e.g., internships and residencies) in the United States. Founded in 1982, the ACGME is a physician-led nonprofit that sets standards for effective graduate medical training programs and monitors compliance with those standards.

Since state licensure requires at a minimum one year of such training, and the great majority of physicians pursue additional training in specific fields overseen by the ACGME and the American Board of Medical Specialties, these organizations have a great impact on the number and distribution of practitioners.

Trainees are a surprisingly large part of the physician workforce, with one out of seven practicing physicians (129,000) in the United States in ACGME-accredited training programs. Trainees participate in 10,600 approved programs, spanning 28 specialties and over 100 subspecialties. ACGME interests include the design and oversight of standards for training programs, from curriculum to pedagogy to the quality of educational leadership and the learning environment. In addition, the ACGME seeks to ensure specific competencies before graduation from accredited programs. The stated mission of the ACGME is "to improve health care and population health by assessing and advancing the quality of resident physicians' education through accreditation." The ACGME also represents the interests of its member organizations—the American Board of Medical Specialties, the American Hospital Association, the American Medical Association, the Association of American Medical Colleges, and the Council of Medical Specialty Societies—each of whom appoints four members to the ACGME's board of directors. The ACGME currently oversees the postgraduate education and training for all MD and, in recent years, the majority of DO physicians. While its mission statement is silent about protecting the interests of the constituent organizations and practitioners, this is likely a relevant goal.

Accredited GME Positions as a Limiting Point for Physician Training and Licensing

From the perspective of this paper, we are concerned with the factors determining the number and characteristics of GME positions and how they affect the physician and health provider

workforce. Since a minimum of one year of GME training is required for licensure, the availability of such positions limits licensing physicians. Overall, there are more first-year GME positions (28,849 in 2017) than there are graduates of American medical schools (18,705 in 2015). Thus, today there are adequate positions for all qualified graduates of American schools, though not all graduates of American schools find positions in geographic locations or in disciplines they desire. Certain specialties, especially those offering higher compensation, perceived lifestyle advantages, or both (e.g., dermatology, radiation oncology, and orthopedic surgery), have more applicants than available positions. As the number of graduates from US schools has been increasing, the surplus of GME positions relative to demand from graduates of US allopathic and osteopathic schools is narrowing.

As discussed in more detail below, graduates of international medical schools now fill most of the remaining open positions (in 2017, IMGs who are US citizens took 2,777 positions, and non-US-citizen IMGs took 3,814). Half of international medical graduates who apply for US GME positions are not accepted, precluding their ability to enter licensed practice in the United States. It is not clear whether this "shortfall" in available positions for international graduates is due to insufficient desire by hospitals for additional positions, their inability to have desired programs accredited, or other factors. IMGs account for a disproportionate share of the positions filled nationally in the primary care specialties of internal medicine, family practice, and pediatrics.

As discussed, graduates of foreign medical schools are required to undertake GME training to qualify for licensure in the United States. This is the case even for those who already completed GME training in their home countries and have outstanding reputations and accomplishments. What drives this requirement for retraining? There may be legitimate concerns

about ensuring quality of physicians who had no clinical training in the United States. But it is also possible that the requirement to repeat training is a response to the interests of specialists and specialty organizations to limit potential competition, rather than a response to public health considerations.

Privileging and Credentialing by Hospitals, Health Systems, and Physician Groups

Whereas the vast majority of US physicians were self-employed in the past, today many are employed by hospitals, physician groups, or health systems. As of 2013, nearly one in five practicing physicians in the United States was employed by a hospital (Goldsmith, Kaufman, and Burns 2016). Less than a third are self-employed, and this trend continues. Even those self-employed physicians who practice independently must obtain hospital privileges to admit their patients and facilitate care to those requiring hospital services. As a result, the processes for awarding hospital privileges and certification are critical in determining the number and types of physicians in practice. Since it is in the ethical, financial, and reputational interest of these organizations to limit privileges to competent, quality physicians, considerable effort goes into adjudicating these decisions, both at the time of initial privileging and upon periodic renewal.

Hospitals establish committees composed of physicians and staff to review these cases and make recommendations to the hospital board. They review letters of recommendation from individuals and departments with knowledge of the applicants, confirm state licensing status, and obtain relevant information available from the board. They review malpractice history, confirm specialty certification, and review complaints that may have been lodged against them. These privileging bodies are important to the healthy functioning of hospitals. They have far more information about the physicians, including their history of quality and safety, than any other

body or group, including state licensing boards. As confidential entities, their activities are not easily studied. However, they could be part of future solutions to render such licensing boards unnecessary, or at minimum, to supplement the boards.

Possible New Uses of Hospital Privileging Committees

Hospital certification processes potentially could be employed in additional ways to enhance the size and quality of the physician workforce. A path could be developed whereby they could be deputized to mediate certification or licensing of trained foreign physicians whom these institutions might sponsor moving to the United States to practice. These organizations have the incentive to identify and sponsor qualified practitioners and to deny privileges to those of uncertain or questionable skill. Most importantly, they are well situated to evaluate the professional performance of these physicians once in place. For such a mechanism to be made operational, cooperative agreements would be required between the sponsoring organization (e.g., a hospital or health system), state licensing boards, ECFMG, and specialty certifying organizations. Such physicians could transition under oversight from provisional to regular licensure, and after an agreed-on minimal period of employment, they could be free to move elsewhere for clinical practice.

The Role of Malpractice Insurance

Medical professional liability insurance, commonly referred to as malpractice insurance, is issued by insurers regulated by each state and has several functions: first, to financially compensate patients harmed through negligent physician conduct; second, to deter harmful behavior by incenting physicians and organizations to behaviors that promote good outcomes;

and third, to insure physicians judged responsible for producing harms against personal financial losses.

Malpractice insurance is one component of the current ecosystem for determining the number and quality of practicing physicians. Nearly all physicians have malpractice insurance, either because their state requires it for licensing (a minority of states), because it is required for obtaining hospital privileges or participation in physician groups (universally the case), or because physicians desire to limit financial liability in the event of malpractice settlements against them.

Although details and circumstances vary, in most circumstances physicians with more adverse events resulting in suits and actions have higher insurance premiums. This is referred to as experience rating. This could limit physician supply if the number of frequently sued physicians were high, and high premiums drove them out of practice or prevented them from obtaining required insurance. While there are some specialties and localities where access to specific providers can be affected by such mechanisms, overall this is an uncommon situation, with limited effect on physician supply (Mello 2005, 621–28).

Malpractice insurance companies do gather information about physician performance, most specifically related to malpractice suits and their outcomes. They provide this information to state licensing boards and hospital privileging committees, and in this way, they participate in the decisions made at those levels. Some insurers are more proactively involved in quality and safety initiatives. One could imagine conditions under which mandatory malpractice insurance could provide a means to gather all the information on physician training and performance now gathered by state licensing boards, potentially rendering these boards redundant and unnecessary.

Impact of Payment System on Provider Workforce

The United States spent approximately $3.3 trillion on healthcare in 2016, representing 18 percent of gross domestic product (HHS 2016). This is currently paid through a roughly even mix of public and private funds, with federal, state, and local governments paying about half and households and private businesses paying half (OECD 2015). How we pay for these enormous healthcare expenses affects how the health provider workforce evolves.

To the extent that healthcare payments are driven by government and third parties, education and workforce needs will be heavily influenced by the priorities of public officials, agencies, and program administrators, as well as insurers and the most powerful incumbent providers acting through regulatory and political processes.

If healthcare payment evolves to be more directed by consumers, education and workforce needs will likely be increasingly influenced by where, when, and how consumers choose to spend their healthcare dollars. If, for example, more consumers paired high-deductible catastrophic insurance with large health savings accounts (HSA), it is likely that the evolution of provider and facility types would accelerate to meet changing consumer demands, including increased sensitivity to cost. Consumers would be incentivized to become better informed, and new businesses would likely arise to provide such information. Ideally, consumers could choose among types of providers with more transparent quality measures and prices, retaining the savings if they choose thriftier options. New types of clinics could emerge to cater to patient preferences for particular arrangements, one example being the direct primary care model, which utilizes a low monthly subscription fee in exchange for office visits, routine tests, and simple outpatient procedures (Eskew and Klink 2015, 793–801). New services via telemedicine would

enable providers to offer certain services with greater efficiency and convenience, possibly at a lower price.

The current mix of payment and insurance approaches to healthcare in the United States, and their legal and regulatory context, are key determinants of today's healthcare workforce. The composition and success of the future workforce will surely be influenced by changes to the payment system. In parallel, changes in our approaches to producing tomorrow's workforce might in turn be capable of nudging the payment system in new directions.

The Impact of New Technologies on Medicine and Medical Education

Medical technology refers to the equipment, devices, and techniques that change the processes and procedures of care delivery. At any given moment, many new technologies are transforming medicine or are on the brink of doing so. These include new diagnostic and therapeutic devices, surgical procedures, drugs (including gene-based therapies), information systems (e.g., biosensors, applications of artificial intelligence [AI], and telemedicine), and more.

In recent decades, many new technologies have impacted the practice of medicine, and this trend will likely accelerate. At its best, new technology enables provision of care that is more effective, safer, more pleasant, or less expensive. Technologies that deliver those benefits tend to find widespread adoption. Technologies that struggle to deliver them, or that cannot do so cost-effectively, tend not to be broadly adopted; they may be disregarded or have limited application until, in a subsequent iteration, their benefits becomes clear. Some new technologies that are adopted may bring with them negative consequences regarding function and satisfaction of the professionals required to employ them, as has been claimed for many applications of the

electronic health records. This suggests that excitement about new technologies must be accompanied by scientific skepticism and commitment to data-driven application.

Responses of the Profession to New Technologies

When a licensed profession senses changes arising from a potentially transformative new technology, professional organizations may either welcome these changes or adopt a defensive pose. Consider telemedicine, which enables physicians to conduct virtual visits with patients. These visits may occur locally or across vast distances, reaching rural areas and others with provider shortages, providing convenience and potentially lower cost. The potential benefits are large, yet resistance may arise in some quarters because the technology opens the door to unwanted competition. Physician organizations such as the AMA have responded by asking states to adhere to current practice laws for telemedicine encounters and supporting laws requiring physicians to be licensed in the state where the patient is located (Farouk 2016).

Pressed to justify resistance to these developments—whether telemedicine or other innovations—the profession typically invokes concern over safety, quality, or threats to the patient-physician relationship, and it seeks to prevent or slow the adoption of new technologies by lobbying, forcing application of rules designed for the old paradigm, or thwarting its reimbursement. These concerns merit consideration and the collection of data to support or deny them. But we should be concerned about efforts to suppress potentially beneficial technologies in the absence of data and in support of narrow professional interests. For instance, in 2015, the Texas Medical Board attempted to enact legislation that would have required doctors to first establish a relationship with new patients in person before allowing consultations using telehealth. The proposed regulation was intended to hamper the proliferation of services such as Teladoc that specialize in facilitating these types of arrangements. State licensing laws are

another roadblock for telemedicine—specifically doctors who wish to see patients across state lines. A potentially positive development on this front can be found in the Interstate Medical Licensure Compact (IMLC), which, though imperfect, could offer a voluntary expedited pathway for qualified physicians who want to practice in multiple states (IMLC 2017). The IMLC is an agreement between 22 states and 29 medical and osteopathic boards in those states, and it could accelerate the application of telemedicine arrangements for interested parties (IMLC 2017). On the other hand, a recent paper argues that this approach is likely to be ineffective (Svorny 2017). Instead, this author argues that federal legislation should be established so that for telemedicine encounters, the location of the interaction between patient and physician is the location of the physician, as if the patient traveled physically across state lines for a consultation. In this way, only one state license would be required.

Machine Learning and Artificial Intelligence

The application of machine learning and artificial intelligence (AI) to medicine is another domain in which beneficial technology might evoke resistance from the organized profession. As stated in a recent article on this subject, "The complexity of medicine now exceeds the capacity of the human mind" (Obermeyer and Lee 2017, 1209–11). These authors state, "Today's medical education system is ill prepared to meet these needs. Undergraduate premedical requirements are absurdly outdated. Medical education does little to train doctors in the data science, statistics, or behavioral science required to develop, evaluate, and apply algorithms in clinical practice" (Obermeyer and Lee 2017, 1209–11). Innovators are designing software algorithms capable of identifying and diagnosing diseases and recommending appropriate treatments. Software sifts through immense collections of data, detects patterns,

and can deal with complexity without susceptibility to human cognitive biases and deficiencies.

AI technology has the potential to revolutionize the way diagnoses are made, increasing accuracy and speed while decreasing costs. For example, 7 out of 32 machine-learning algorithms entered into a competition to detect lymph node metastases in tissue sections from women with breast cancer and outperformed a panel of 11 pathologists (Ehteshami et al. 2017, 2199–210). The most optimistic proponents of AI predict that computers will eventually replace many human providers, while others see AI complementing and assisting medical professionals and perhaps broadening the scope of unsupervised practice for nonphysicians. For now, the technology is very early and still evolving, with setbacks as well as accomplishments.

New technologies may fail to deliver on their promises. Today, poor implementation of many clinical computing systems, their optimization to enhance billing rather than to enhance human interactions, and the burdensome requirements of the computer-physician interface have contributed to physician dissatisfaction and burnout. But when the day comes (as it almost surely will) that AI performance reaches or exceeds human equivalence in selected domains, we should be wary of self-serving protectors of the status quo coloring our judgment of what should be allowed.

Considering the likely future benefits of technology is not to diminish the critical ongoing value of human interactions and capacities in healthcare. It is very likely that the ideal outcome will be effective collaboration between providers of diverse backgrounds and training and computers. Ideally, both providers and patients in the future will be able to tailor how they wish to interact with human providers versus computers and other new technologies.

Permissionless Innovation

To gain the most from what technology can offer, policymakers should be open to the paradigm of "permissionless innovation." That is the idea that innovators, early adopters, and experts can adequately test and endorse some new technologies with less need for government preapproval or legislation than required today (Cerf 2012; Thierer 2016). Technology is bringing about positive change at an increasing speed—far too fast for regulatory agencies to keep up. We should rely more explicitly on the judgment of decentralized organizations like integrated health systems or academic health centers in such matters. Though there is much in the tradition of medical practice that we should celebrate and maintain, acceptance of and willingness to embrace technological progress should be hallmarks of modern physicians and health organizations. These opportunities should be embraced in medical curricula and by professional organizations rather than stifled or delayed.

Recommendations

The number, training, and professional capabilities of the health provider workforce greatly influence cost, access, and quality of care. Today's health workforce results from a complex mix of organizational, regulatory, and sociologic factors, many of which operate without transparency and are poorly understood by the public. A premise of this paper is that many aspects of the current workforce are suboptimal. To accelerate change, whether in response to projected shortages, pressures to reduce cost and increase quality, the introduction of potentially beneficial new technologies, or most likely all these, we must first understand the controlling factors and their interactions. From this foundation, recommendations can be made. Their common theme is to promote an enhanced supply of qualified providers—trained more

efficiently and with greater ability to respond to the needs of consumers in diverse geographic and practice settings.

Achieving this today requires working within the framework of government regulators and private organizations that control these issues on behalf of the profession(s). A future goal is to progressively reduce the monopoly control these organizations exert on decision-making, in a manner that now limits the pace of innovation. To facilitate reaching this goal, we should be alert to circumstances where the preferences and needs of the profession conflict with those of the public; when that happens, we must support policies that favor prioritizing the public's interest.

Approaches to Enhancing the Supply of Qualified Physicians

From US medical schools. There are many more applicants to US medical schools today (53,000 in 2016) than there are available positions (21,000 in 2016), as has been the case for decades. Many of these applicants are likely qualified to become physicians. We strongly encourage the LCME and the COCA to continue current efforts to accredit additional US schools and encourage incremental positions in existing schools.

- We encourage the LCME to better articulate its intention to accredit schools that embrace diverse models for medical education and that seek to produce diverse types of graduates. This especially includes schools whose primary goal is educating frontline providers, while others may continue to specialize in educating graduates—some of whom might excel in research, policy, and leadership.
- We encourage the LCME to endorse the goal of accrediting paths to shorter and less expensive medical education, and to promote approaches and potential tradeoffs required to do so.

- We encourage the LCME to embrace competence-based and time-variable approaches to medical education. Similar approaches should be applied to GME training. Competency-based evaluations are more desirable and relevant than the process-based measures that now dominate physician assessment, and through the use of big-data approaches, they should become possible to implement. While these approaches may be challenging to implement and validate, development and testing of competency-based assessments should be encouraged, and as their predictive ability is confirmed, they would enable modification or replacement of existing assessment strategies. This could eventually change the current approach of linking licensure to graduation from an LCME-accredited school.
- We encourage the LCME to continue openness to accrediting new for-profit schools, while paying close attention to the quality of the physicians they produce. These schools might be more likely incentivized to create educational efficiencies that if successful might be adopted more broadly.

From international medical schools (other than Canada). There are many more graduates of international medical schools who would choose to practice in the United States (to the potential benefit of our citizens) than our current system allows to be licensed. This includes IMGs who are certified by ECFMG to apply for GME residencies but do not match, and it includes fully trained IMGs who are dissuaded from coming to the United States because they don't wish to repeat their GME training as now required by ECFMG and state boards.

- We encourage new mechanisms by which highly qualified (and fully clinically trained) IMGs can become eligible for licensure without requiring their retraining in the United States as residents or fellows. This would require a change in ECFMG policy now requiring such retraining, a change in state board requirement of this ECFMG policy, or

both. One approach could be a form of provisional licensure under the aegis of a hospital or health system, which would be well positioned to evaluate IMGs' competence. A state seeking to increase its physician supply could initiate this pathway at the level of its state board, independent of a change in national ECFMG policy.

- We encourage steps to remove barriers that prevent qualified IMGs from eligibility to gain licensure in the United States. One approach would be to incentivize additional GME training positions for qualified IMGs who now fail to match for residencies. It is currently unclear whether the limiting factor in creating such positions is a negative judgment about the quality of the candidates, an inability to accredit sufficient GME training opportunities, or some other factor, and research to answer this should be carried out.

Approaches to Increasing the Supply and Functional Reach of Non-Physician Providers

As discussed, the sufficiency of the physician workforce is influenced by many factors. In any plausible scenario, there will be an increased need for nonphysician providers, namely NPs and PAs, to provide optimal healthcare to the public. In just 50 years, responding to clearly expressed demand from consumers and providers, these two professional tracks went from nonexistence to a workforce nearly 40 percent the size of today's total MD and DO workforce. The overall goal going forward should be to facilitate demand-driven growth of these provider professions, to enhance their capacity to legally function both independently and as part of interprofessional teams, and to facilitate the development and deployment of additional types of providers. We specifically recommend the following:

- Increasing the number of states granting NP independence from physician oversight.

- Encouraging development and utilization of competency-based approaches to enabling increased scope of practice for NPs and PAs.
- Developing pathways for currently unlicensed categories of providers (e.g., health coaches, community health workers, and community paramedics) to deliver care as effective extenders of licensed professional providers.

Approaches to Enhancing the Adoption of New Technologies in Medical Education and Practice

The basic orientation toward technological progress should be one that allows institutions, organizations, and practitioners to embrace the new tools and techniques that they see fit to use. Whether their goal is to produce well-trained physicians more efficiently or to deliver high-quality care more effectively, the adoption of technology should be guided by what works, and it should not be encumbered by unnecessary restrictions or artificial barriers erected by gatekeepers protecting their narrow interests. In other parts of American life (e.g., computers, cell phones, cars, and entertainment), technology is consumer driven and, compared to medicine, relatively unconstrained by regulation—and our lives are all the better for it. In healthcare, it too often feels the opposite. We specifically recommend the following:

- Developing more qualitative, contextually appropriate methods for evaluating educational effectiveness in the medical school accreditation process, allowing schools to experiment with new curriculum designs, educational technologies, and professional partnerships.
- Promoting state-level policies that encourage openness to telemedicine from a licensure standpoint and reimbursement for telemedicine from a payer standpoint.

- Embracing the use of artificial intelligence technologies in the practice and teaching of medicine as augmentative tools, allowing scopes of practice to evolve, based on evidence, to match the new combined capabilities of "man and machine."

Conclusion

Health providers—MDs, DOs, NPs, PAs, and emerging types of unlicensed providers—are one of many important determinants of the nation's health. It is therefore important to understand how we educate, license, and credential these providers; how their numbers and functions are determined; which public and private institutions regulate and manage these issues; and what the consequences of their actions are for health and the healthcare system. As healthcare has evolved dramatically over the past century, the system for educating, licensing, and credentialing providers has evolved as well. Unfortunately, this ecosystem today is excessively complex and largely nontransparent, involving many interlocking organizations, and organized medicine itself may play an excessive role in determining its own future state. Public accountability is limited, making it difficult to innovate and produce beneficial change. As a result, we have argued here that neither the supply nor the quality of the provider workforce has kept pace with changing needs and opportunities provided by modern medicine and the broader healthcare system.

Despite many uncertainties in projected workforce needs, we have argued that more physicians are needed today—and likely in the foreseeable future—especially in geographic areas and specialties that are now underserved. This will most likely need to involve educating more physicians in the United States and licensing more graduates of international schools; the latter will entail changes to current licensing requirements. In the United States, physician training should become shorter, less costly, more steeped in modern technology and pedagogy,

more effectively linked to competence-based assessments, and better prepared for team-based care and emerging interfaces with computers and AI-based health assists. The growth of nonphysician providers as key elements of the workforce seems both inevitable and appropriate. Adoption of creative approaches to innovation in these areas should be facilitated, while efforts to thwart their development based on narrow professional interests or unintentional regulatory gridlock should be limited.

As we seek to evolve a healthcare system with improved access, cost, and quality, we should not underestimate the important role of an invigorated health provider workforce, in association with many other necessary changes, in achieving these aims. Shedding greater light on the factors that have impeded progress in the area is an important first step. With the right decisions, we see the future as being very bright.

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