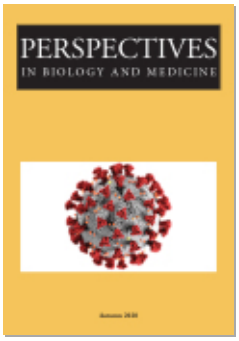
The US Health Provider Workforce: Determinants and Potential Paths to Enhancement



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The US Health Provider Workforce

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ABSTRACT The health provider workforce is shaped by factors collectively influencing the education, training, licensing, and certification of physicians and allied health professionals, through professional organizations with interlocking and often opaque governance relationships within a state-based licensing system. This system produces a workforce is that is insufficiently responsive to current needs and opportunities, including those created by new technologies. This lack of responsiveness reflects the complex, nontransparent, and cautious nature of the controlling organizations, influenced by the economic interests of the organized professions, which seek protection from competitors both local and international. The first step in addressing this is to comprehensively examine the organizational complexity and conflicted interests within this critical ecosystem. Doing so suggests areas ripe for change, to enhance the health workforce and benefit public health.

Despite per capita expenditures exceeding those of any other country, the US health-care system has problems of access, cost, and quality that have proven refractory to the efforts of policy experts and politicians and the desires of a concerned public. While health insurance coverage is much debated, factors re-

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sponsible for educating, licensing, and credentialing physicians and other health-care professionals are less often discussed. These factors are shaped by the laws, regulations, and organizations that together determine the number of providers, their required programs of education and clinical training, and paths to licensure and credentialing.

Changing the US approach to training and credentialing physicians and other providers is no easy task. The health provider workforce is rooted in the history of the health professions, influenced by cultural, legislative, and regulatory factors that largely evolved (and are maintained) behind the scenes. How these operate is poorly understood by the public and by many system participants. While the organizations responsible for current practices see their missions and policies as advancing the public good, many are also influenced by self-interest.

The goal of this article is to provide context for informed discussions about potential changes to the health provider workforce to improve the US health-care system. We first examine several meta-issues related to the identity of the health professions, assessing the adequacy of the workforce, and identifying the profession's role in self-regulating its numbers and functions. We then delineate the major institutions that shape the US health-care workforce, emphasizing their distinct roles and interactions. Our greatest emphasis is on physicians, but allied health professionals—whose roles in health care have been increasing—are also considered. Finally, we explore the role of new technologies on the future health workforce, and the potential impact of changing insurance and payment systems on these developments.

META-ISSUE I: WHAT ARE "THE HEALTH PROFESSIONS"?

The history of medicine includes healing traditions arising within numerous cultures, from ancient Babylon, Egypt, Greece, India, and China, to Europe and eventually America. Despite humanistic intent, these healers had limited capacity to enhance health and many opportunities to worsen it, lacking a scientific basis for medical practice. As scientific medicine emerged in the 19th century, "physicians" with diverse training and experience were joined by self-trained barber-surgeons, apothecaries, drug peddlers, and charlatans to encompass a health provider workforce.

Expansion of the scientific underpinnings of medical practice brought efforts to modify and formalize medical education and professionalize medical practice, providing assurance to the public that practitioners were properly trained, thereby enhancing the standing of the profession (Starr 1982). These motivations produced the current approach to accrediting medical education, professional licensure, and certification.

Today, new knowledge is rapidly transforming health care, however the current system for certifying the profession may inadvertently prevent innovation

from taking full advantage of our new capacities and understanding. Tensions exist between enhancing public welfare through professional standards and protecting incumbents from unwanted competition (Starr 1982).

The health professions evolve by changing an existing profession, and by establishing new professions to meet needs inadequately addressed by existing professions. Osteopathic medicine began as an offshoot of the medical profession in mid-19th century Philadelphia. Its founder objected to medicine as practiced at the time, establishing a school with new elements (physical manipulation) not accepted (then or now) by the profession. Over recent decades, osteopathic medicine evolved as a branch of medical practice; doctors of osteopathic medicine (DOs) today undergo very similar training and licensing as medical doctors (MDs) in all 50 states, and osteopathic medicine has grown rapidly, comprising 8.5% of the physician workforce. The modern nursing profession also began in the 19th century and continues to evolve; it now includes nurse practitioners (NPs) who engage in independent practice. Physician assistants (PAs), created in the 1960s, function today within teams of providers to augment physician function, but may evolve toward greater independence.

Opportunities for further workforce transformation are likely through further evolution of physicians, NPs, and PAs functioning together as "interprofessional" teams, and completely new training paths and providers to take advantage of new technology, especially if existing professions fail to do so.

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

Assessing the adequacy of the health provider workforce presents many analytic challenges. Over the past 30 years, expert opinion has swung from predictions of physician surplus to shortage.

Several quantitative measures are employed to assess workforce adequacy; one is the number of licensed physicians per population. In a comparison of 11 industrialized nations, the US had the second fewest at 2.5 physicians per 1,000 population, compared to a mean of 3.1 and a high of 4.2 for Norway (Grover, Orlowski, and Erikson 2016, 11–19). Another metric is average wait time for appointments, which varies by specialty, location, type of insurance coverage, and other factors. Access to physicians will always be less in rural settings. Average wait times for a family physician of 19.5 days (Gudbranson, Glickman, and Emanuel 2017, 1945–46) exceed what many view as desirable. A different approach takes the number of physicians, suggests a reasonable number of visits per physician per day, and concludes there are more than enough physicians to accommodate patients in the US if care were efficiently organized (Gudbranson, Glickman, and Emanuel 2017). Unfortunately, it isn't.

Other predictions are based on provider supply and expected demand for services. The demographics of our aging population suggest more care per person will be needed. Physicians are also aging, with 27% of licensed physicians over age 60. Physicians as a group work fewer hours today, and women physicians work fewer hours than men on average; as women's share of the physician workforce increases (32% today, 46% of current trainees), total available physician hours will fall. Additionally, Medicaid expansion has increased demand for care from previously uninsured individuals. Taken together, these factors suggest increased physician shortages in the future.

Workforce adequacy may also be influenced by "physician-induced demand" (Reinhardt 1985), whereby asymmetry of information between patient and provider permits (some) physicians to recommend testing and procedures more aligned with personal economic gains than patient needs. Although physician-induced demand exists, its prevalence is debated (Rosenbaum 2017).

Other factors that might affect workforce projections include (1) numbers and scope of practice of nonphysician providers; (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 mobile health apps.

The Association of American Medical Colleges (AAMC) is the organization whose workforce projections—which 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 (Dall et al. 2015). Because so many factors influence such projections, healthy skepticism is justified.

META-ISSUE III: SELF-REGULATION OF THE MEDICAL PROFESSION

The medical profession plays a key role in controlling the identity, size, and function of the medical workforce. To sociologists, a profession is "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, 15). Additional attributes include the authority the profession possesses, claims to autonomy and sovereignty of professional judgments, group solidarity, and ethical standards. These attributes provide status and prestige, financial rewards, and power, including substantial control over the profession's own members; these often lead to grants of state monopoly and behavior as a cartel.

As the medical profession has evolved over the past century, so too has its regulation by the state, the most visible locus being state licensing and disciplinary mechanisms. Through licensing flow additional loci of professional control, in-

cluding accreditation of undergraduate and graduate medical education, specialty certification, and rules controlling how internationally educated physicians may be licensed to practice.

The organized medical profession has accrued the power to control key pathways and decisions, but the public and many in the profession and policy world have limited understanding of how these influences are exerted. That is because the myriad controlling organizations have complex operations and governance and are generally nontransparent. This web of interactions limits accountability, innovation, and our ability to determine whether their decisions reflect the interests of the profession or the public.

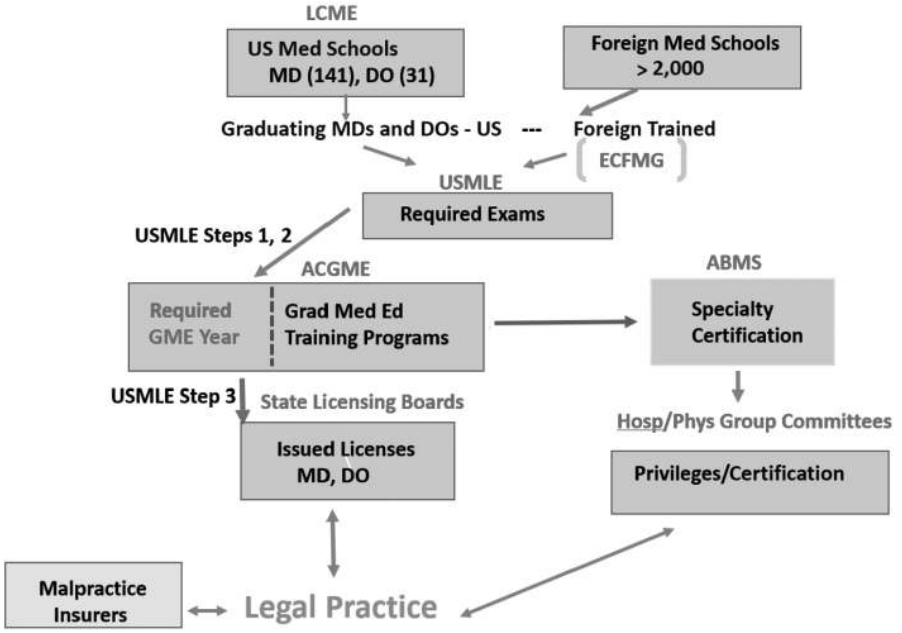
KEY INSTITUTIONS THAT SHAPE THE WORKFORCE

The organizations that shape the health provider workforce and the relationships among them are depicted in Figure 1, and their major roles are briefly described here:

- **State licensing boards**—To legally practice, physicians must be licensed by the states. We review their remit, and what they assure the public about licensed physicians.
- **US medical schools, allopathic and osteopathic**—These are the main providers of new physicians (MDs and DOs) in the US. We review their accreditation by the Liaison Committee on Medical Education (LCME) and how they might evolve to better meet the needs of the public.
- **Foreign medical schools**—Graduates of foreign medical schools make up 25% of the physicians practicing in the US. We review the paths by which foreign med school graduates are approved to practice in the States, as overseen by the Educational Commission for Foreign Medical Graduates (ECFMG).
- **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, a process overseen by the Accreditation Council for Graduate Medical Education (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.

Medical Licensure

To legally practice medicine, a physician must hold a valid medical license, an authority delegated to the states. Though licensing existed in the early 19th century, its current form began in the early 20th century. The medical profession has evolved dramatically since then, and licensure, though still important, is less central to the regulation and function of the profession.



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.

FIGURE 1

Key influences over the health provider workforce in the US.

State boards of licensure, established by statute, set standards for licensure in each state, acting as gatekeepers to legal practice of the profession. Their first role is administrative, checking credentials, certifying graduation from an accredited US medical school, passing the three-step national US Medical Licensing Examinations (USMLE), and completion of one year in a graduate medical education (GME) program accredited by the ACGME. State boards also run criminal background checks.

State boards investigate complaints about licensed physicians arising from the public, hospitals, or health organizations, and collect information from malpractice insurers on pending and settled cases. They are "complaint-driven" organizations and conduct no prospective reviews of physician behavior or quality. The vast majority of issues resulting in disciplinary action relate to physician use of drugs or alcohol, assault or inappropriate sexual behavior toward patients, or mental illness. Board staff investigate complaints and make recommendations to the board.

Boards keep complaints private while making public final sanctions. The number of complaints is impossible to identify because of confidentiality, but

final disciplinary actions are limited, affecting less than 0.5% of licensed practitioners per year (Ameringer 1999; Grant and Alfred 2007). Board settlements may allow continued practice, perhaps after a period of suspension, sometimes with limitations to scope of practice. In 2016, 267 physicians had their licenses revoked (FSMB 2016, 16). Thus, licensing boards identify and discipline the most egregious outliers in the profession suffering from impairment, incompetence, or criminality, but have little or no role in providing broader assurances of competence. In one study, two-thirds of physicians who lost privileges or had malpractice claims for sexual misconduct over a 10-year period suffered no board sanctions, suggesting deficient oversight (AbuDagga et al. 2016).

Initial licensure after medical school graduation and one year of GME training authorizes the licensee to conduct any procedure 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, did not claim 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 specialties (and subspecialties) are independent of state licensure.

Scope-of-Practice Decisions

State boards also define "scope of practice," or which activities and procedures are covered by the license. These are especially salient for nonphysician providers, such as NPs and PAs, providers overseen by their own professional organizations under state laws. All states have nurse practice acts (NPA) establishing boards of nursing that create rules and regulations for the profession, which undergo public review before enactment. The growth in NP scope of practice has often been disputed (Donelan et al. 2013), with medical societies seeking reduced NP scope of practice and independence from MD supervision (Iglehart 2013). PAs are typically licensed by state medical boards.

The official remit of state boards is to protect the public's health through licensure, discipline, and general professional regulation. 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 previously the direct responsibility of medical societies) (Starr 1982), since the mid-1960s most boards have both physicians and lay community members, typically chosen through a state process influenced by political considerations.

State Boards as a Potential Anticompetitive Mechanism

Licensing boards also function to protect the profession against competition from alternative providers. In the early 20th century, organized medicine used

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 threats of legal action. Regulatory capture occurs when an agency established to serve the public interest advances the commercial or political concerns of dominant incumbents (Dal Bó 2006). Organized medicine has sought to keep medical boards subordinate to state medical societies, by controlling the selection of board members and by involvement in staffing and management.

The public desires protection from charlatans, sociopaths, incompetents, and crooks, and state licensure is one mechanism to achieve that goal. But licensure may also limit innovation. In many industries, innovation and disruption involve transitioning from more highly trained workers to those less highly trained, or differently trained, permitting more routinized approaches to facilitate access and lower cost (Christensen, Grossman, and Hwang 2009). Such evolution requires flexible use of providers, based on local knowledge of competencies. In contrast, paths involving licensure adapt slowly because of regulatory conservatism and special-interest rent-seeking.

Accreditation of Medical Schools

To grant medical degrees, US medical schools must be accredited by either the LCME for the MD degree or the Commission on Osteopathic College Accreditation (COCA) for the DO degree.

Medical schools are strongly influenced by the accreditation process, which entails comprehensive reviews assessing curriculum, administration, faculty, staff, students, and facilities, taking several years to complete. Institutions begin preparations years in advance, often engaging consultants. Schools generate a comprehensive self-examination to assess compliance with extensive accrediting standards, including many process measures. The self-examination is followed by visits by representatives of the accrediting body. If shortcomings are discovered, the institution drafts a plan for remediation, and may be placed on probation until issues are resolved.

Strictly speaking, accreditation is voluntary, as a medical school could forgo accreditation and enroll students. However, to obtain a license, physicians must take the 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 requires graduation 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 required for receipt of federal loans. Accreditation is thus a de facto government requirement.

Schools spend enormous effort to understand what the LCME wants, and does not want, to emerge from reviews without identified deficiencies. This reduces the desire for experimentation and innovation. Some schools have experimented with new curricular approaches (Cangiarella et al. 2017; Loftus, Willoughby, and Connolly 1997). The University of Missouri–Kansas City has a six-year integrated MD program with entry after high school (UMKC 2020), much like the standard approach in Europe and elsewhere in the world. Two Canadian schools and several in the US now have three-year postbaccalaureate MD programs (Abramson et al. 2013). There are many reasons—including loss of tuition revenues—that such approaches are uncommon. It seems clear that the high-stakes accreditation process disincentivizes large-scale experimentation.

The LCME accepts that schools with diverse goals for their graduates should exist. Some schools stress educating 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.

Responding to Projected Physician Shortages

Analysts (including analysts at the AAMC) have vacillated over whether there is an oversupply of physicians or a shortage of current (and projected) physicians, but most agree that shortages exist in specialties such as primary care and in particular regions and communities, and will likely increase (Johnson 2014; Petterson et al. 2012; Salsberg 2015). In response, the AAMC has encouraged opening new medical schools and expanding class size, leading the number of MD graduates in the US to increase from 16,488 to 22,200 (projected) between 2002 and 2021. Graduates of DO schools have risen from 2,968 to 8,700 over the same interval.

Will this increase in physician supply address projected shortages in specific specialties and geographical areas? Most observers think not (Gudbranson, Glickman, and Emanuel 2017). The expansion of medical school enrollment from 2002 to 2016 did not change the proportion of graduates going into internal medicine, pediatrics, and family medicine residencies (Dalen and Ryan 2016). Many specialty choices are made after graduation, but how we educate physicians affects these choices. Texas Tech University Health Sciences Center developed the Family Medicine Accelerated Track with accompanying scholarship support that shortens training by one year for students committing to family medicine (Jones and Berk 2016). The educational factors and admissions criteria that influence postgraduation career decisions needs more attention.

The Financial Models of Medical Schools

Prior to the 20th century, most medical schools were for-profit, "proprietary" schools, with few academic standards, producing "physicians" of little skill or

competence. Students paid fees to instructors, and most were on the edge of insolvency. The impact of Abraham Flexner's 1910 report on medical education, together with economic factors, brought the closure of many such schools. Flexner believed medical schools should be associated with nonprofit universities; not surprisingly, nearly all medical schools today are nonprofit entities and, as Flexner recommended, are affiliated with universities.

The financial structures of medical schools are highly variable, reflecting diverse operational, fiscal, and governance arrangements. One source of revenue is tuition. Schools also need revenues to support research programs. In many schools, research has grown very large, with budgets far exceeding those supporting education. Schools derive revenues from sponsored research grants (the majority from the National Institutes of Health), gifts, endowment income, and, to a widely variable degree, funds transferred from clinical operations to support education and research. For research-intensive schools, the cost of educating medical students is a small fraction of the overall school budget (for example, education accounts for approximately 6% of the Harvard Medical School budget). Recent downward pressure on sponsored support of biomedical research could threaten the current model of many research-intensive medical schools (Johnson 2016).

More Applicants Than Openings

Despite expansion, there remain many more applicants to US medical schools than available openings. In 2019, 53,371 applicants sought 21,869 openings, with 39% of applicants finding a position, compared to 42% in 2006 (AAMC 2019). A very limited number of for-profit medical schools, both allopathic and osteopathic, have received accreditation in recent years (Adashi, Krishna, and Gruppuso 2017). Success of a for-profit business model will likely require innovation to reduce the cost of education and the ability to scale class size, emphasizing education of practitioners rather than research.

Accredited Schools Connected to Health Systems

The LCME has also accredited schools arising from integrated health systems (such as Geisinger and Kaiser) rather than universities. This creates opportunities to integrate health education across medical school and graduate training, and across health professions (Macy Jr. Foundation 2017). A recent article expressed concern that a "two-tiered" system of medical education might be arising (Feldman et al. 2015), but we do not share this concern. There is no single tier now, and increased uniformity of educational approaches seems undesirable.

It is impossible to determine whether current accreditation has optimized the training of doctors, since alternative approaches within the US don't 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 (IMGs) do as well as or better than graduates of LCME-approved schools (Norcini et al. 2014; Tsugawa et al. 2017). More qualitative and outcome-based measures of educational experience are needed (Davis and Ringsted 2006).

Graduates of Foreign Medical Schools

International medical graduates (IMGs) are an essential component of the US health-care system, representing 23% of physicians practicing today (approximately 240,000) and a similar percentage of physicians in graduate medical training programs. IMGs have 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 are predicted to increase in primary care and specialties like general surgery (Grover, Orlowski, and Erikson 2016). Welcoming quality foreign-trained physicians could help address this.

How is the number of foreign-educated physicians licensed to practice in the US determined? The ECFMG was created 60 years ago to perform this function, and it represents the interests of the organized medical profession. Its board includes 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). The ECFMG is the designated gatekeeper for IMGs seeking US licensure, certifying valid diplomas from among the 2,900 medical schools registered in the World Directory of Medical Schools (Duvivier et al. 2014). Graduates of medical schools outside the US or Canada who wish to be licensed to practice in a state in the States must complete a number of steps requiring interaction with ECFMG (see Table 1).

Why are fully trained IMGs—who in addition to medical school have completed advanced clinical training in their home country—required to repeat GME training in the US, a major disincentive for relocation, especially for those from economically advanced countries, with fewer incentives to emigrate? The ECFMG notes the need to ensure the quality of the "imported" IMGs and their ability to function in an American environment. While plausible, this doesn't justify retraining in all cases. We could have mechanisms providing evidence of competence without retraining.

From the perspective of the health and welfare of Americans, more licensed, foreign-trained physicians would likely 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, especially in primary care and in rural areas (MDH 2018).

Canada has a relatively open policy toward incoming IMGs, with specialists and general practitioners on the national list of "in-demand occupations." IMGs

TABLE 1

Steps for Graduates of Medical Schools Outside the US or Canada to Become Licensed

1. **The applicant must apply for and pay a fee to ECFMG.**
   The fee for the Application for ECFMG Certification is $145.

2. **The ECFMG-approved applicant must pass the first two steps of the United States Medical Licensing Exam (USMLE).**
   The examinations are long and rigorous, and the fees for the examinations are not trivial. The fee for the Step 1 examination is $965, plus an "International Test Delivery Surcharge" if the test is taken outside the United States or Canada. The fee for the Step 2 Clinical Knowledge examination is also $965. The fee for the Step 2 Clinical Skills examination is $1,600.

3. **The applicant must gain admittance to a US residency program.**
   ECFMG certifi cation is required for an IMG to enter the residency mat ch. In 2020, 40,084 applicants competed for 34,266 first-year residency positions and 2,990 second-year residency positions offered in the match (ECFMG 2020). There were 6,907 non-US-citizen IMG applicants and 5,167 US-citizen IMG applicants (together equaling 12,074 IMG applicants). The match rates for non-US-citizen IMG applicants and US-citizen IMG applicants were both approximately 61%, compared to 93.7% for graduates of US allopathic schools (ECFMG 2020). There may be as many as 60,000 unlicensed IMGs in the US (Young et al. 2011). Most take other jobs, both as nonphysician health providers and in an array of positions outside health care, though detailed data are hard to find.

   Graduates of international schools who are not US citizens must obtain a visa to start GME training, with sponsorship by the ECFMG. Graduates of foreign schools who *are* US citizens are 30% of the nearly 10,000 ECFMG-certified IMGs per year; most of these US citizens graduate today from Caribbean schools (ECFMG 2018).

4. **The applicant must pass Step 3 of the USMLE.**
   Pass rates in 2018 for first-time takers of the Step 3 clinical skills exam (taken at the end of the first GME year) were 98% for MD graduates of US and Canadian schools and 90% for IMGs (USMLE 2020). Whether the modestly lower pass rate for IMGs represents the quality of the pool of students, the quality of their education, their English language proficiency in a test-taking scenario, 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 US graduated from schools in India (10.9%), Pakistan (7.7%), China (2.1%), Mexico (2.0%), the Dominican Republic (1.9%), and the Philippines (1.2%), 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 2017, 2020.

must obtain a full or provisional license from the provincial college of medicine before they can practice, which may involve retraining. However, IMGs may bypass postgraduate training requirements if they did residency training in certain jurisdictions (Australia, Hong Kong, Ireland, New Zealand, Singapore, South Africa, Switzerland, the United Kingdom, or the US). IMGs now constitute upward of a quarter of the physician workforce in Canada (Campbell-Page et al. 2013).

Evidence indicates that IMGs licensed through current procedures perform as well as graduates of US and Canadian schools (Tsugawa 2017). Concerns that additional physicians would compete with graduates of American schools reflect protecting the profession from competition rather than concern for public health.

Allied Health Professions

Allied health professionals are nonphysician clinicians trained to identify, evaluate, treat, and prevent diseases, including NPs, registered nurses (RNs), PAs, physical therapists, occupational therapists, audiologists, and speech-language pathologists, among others.

NPs are registered nurses with advanced education and clinical training enabling provision of a broad range of primary and preventive care. They are competent to diagnose, treat, and manage diseases and write prescriptions, and 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 290,000 licensed NPs in the US today (AANP 2020).

PAs practice medicine in team-based settings under physician supervision, taking medical histories, conducting basic physical examinations, and interpreting lab results. They provide health education to patients, and follow-up care. Increasingly PAs specialize in areas such as emergency medicine, surgery, or critical care. They generally have master's degrees; several programs for PA doctorate degrees have been established. Their main professional body is the American Academy of Physician Assistants (AAPA); over 115,000 PAs are practicing in the US.

All US states, the District of Columbia, and US territories rely on certification bodies for licensure and regulation of NPs and PAs. However, states determine the scope of practice. 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. In about half of states, NPs and PAs are under "reduced practice" or "restricted practice," requiring collaborative agreements or direct and close physician supervision, sometimes requiring NPs to pay physicians consulting fees.

NPs and PAs are a beneficial component of the health-care system, mitigating physician shortages, particularly in rural and underserved areas. NPs and PAs per-

form many primary care services as safely and effectively as physicians (Horrocks, Anderson, and Salisbury 2002). Treatment practices, prescribing behavior, and resulting health status have been found to be comparable (Venning et al. 2000). Patients report satisfaction with care received from NPs and PAs, and tend to view them as similar to physicians in primary care settings. Both professions are eligible for certification as Medicare and Medicaid providers, are generally seen as cost effective across a range of primary and specialty care services, and receive favorable reimbursement from commercial payers.

Some physician groups, seeing a competitive threat, vigorously advocate for state-level actions to limit NP and PA scope of practice (Altman, Stith Butler, and Shern 2016).

Currently Unlicensed Health Providers

Health may also be advanced by providers not licensed or currently seen as professionals, including health coaches, community health workers, and community paramedics, among others. Community health workers with variable training and roles have been employed in many countries, improving health of the populations they serve (Kangovi et al. 2017; Phalen and Paradis 2015). The capabilities of paramedics and EMTs may be expanded beyond customary roles; community paramedics (CPs) may provide some primary care services, home assessment, health education, and services such as wound care.

Graduate Medical Education

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 accredited positions, GME positions are rate-limiting for licensing physicians. Beyond this minimal requirement for licensure, the vast majority of physicians pursue additional postgraduate training in diverse clinical specialties and subspecialty fellowships.

The number and distribution of these GME training opportunities is determined by two factors. First, hospitals must be willing and able to provide such training programs. Second, the training programs must achieve accreditation, to fulfill licensure requirements and permit certification in specialized practice 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, have been subject to much discussion. GME training existed long before Medicare funding began in 1965, albeit with lower compensation. Hospital reimbursement from Medicare for GME training is substantial, estimated at between $10 billion and $12 billion in 2015 (CRS 2019), paying for trainee compensation, the costs

of educational infrastructure, and an expected increased cost of care provided by trainees. These hospital payments were part of the grand bargain facilitating passage of Medicare and Medicaid legislation by Congress, despite opposition from the profession and incentivized expansion of GME programs.

The AAMC argues that despite these financial subsidies, academic health centers lose money on physician training but nevertheless support training as part of their social mission (Grover, Slavin, and Willson 2014). Others, including many economists, assert that hospitals benefit financially from GME training, since trainee-enhanced hospital revenues exceeds educational costs (Chandra, Khullar, and Wilensky 2014). 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, setting the number of positions at 1996 levels, where it remains today. Nonetheless, the AAMC cites the Medicare GME funding cap as the main reason GME opportunities have not expanded further (Chandra, Khullar, and Wilensky 2014; Grover, Slavin, and Willson 2014). GME funds are not deployed to incentivize choices of specific specialties, more likely the consequence of influence exerted by medical specialties than any public health argument.

Role of the ACGME

The ACGME accredits graduate medical training programs (including internships and residencies) in the US. Founded in 1982, the ACGME is a physician-led nonprofit that sets standards for 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 fields overseen by the ACGME and the American Board of Medical Specialties (ABMS), these organizations exert control over 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 US in ACGME-accredited training programs. Approximately 10,600 approved programs span 28 specialties and over 100 subspecialties. 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 ABMS, the American Hospital Association, the AMA, the AAMC, and the Council of Medical Specialty Societies (CMSS)—each appointing four members to its board of directors.

Accredited GME Positions Limit Physician Licensing

Since one year of GME training is required for licensure, the availability of such positions limits licensing physicians. There are more first-year GME posi-

tions (28,849 in 2017) than graduates of American medical schools (18,705 in 2015), creating adequate positions for all qualified graduates of American schools. Certain specialties, especially those offering higher compensation, perceived lifestyle advantages, or both (such as dermatology, radiation oncology, and orthopedic surgery), have more applicants than available positions.

Graduates of international medical schools now fill most remaining open positions (in 2017, IMGs who are US citizens took 2,777 positions, and non-US-citizen IMGs took 3,814). Half of IMGs applying for US GME positions are not accepted, precluding their ability to practice in the US. IMGs account for a disproportionate share of the positions filled in the primary care specialties of internal medicine, family practice, and pediatrics.

The requirement that all IMGs with specialty training must repeat training reflects the interests of specialists and specialty organizations to limit competition.

Hospitals, Health Systems, and Physician Groups

Whereas the vast majority of US physicians were formerly self-employed, today many are employed by hospitals, physician groups, or health systems. As of 2013, nearly one in five practicing physicians was employed by a hospital, and less than a third were self-employed (Goldsmith, Kaufman, and Burns 2016). Even self-employed physicians practicing independently must obtain hospital privileges to admit patients requiring hospital services, making processes for awarding hospital privileges and certification critical in determining the number and types of practicing physicians.

Hospital committees of physicians and staff review letters of recommendation, state licensing status, and relevant information from state boards before making recommendations to the hospital board. They confirm malpractice history, specialty certification, and any complaints lodged against the candidates. These privileging bodies have far more information about physicians' history of quality and safety than any other body, but as confidential entities, their data are not easily accessed.

These processes could be employed to enhance the size and quality of the physician workforce, if deputized to mediate certification or licensing of foreign physicians they might sponsor. Cooperative agreements would be required between the sponsoring organization (hospital or health system), state licensing boards, the ECFMG, and specialty certifying organizations. Under oversight, such physicians could transition from provisional to regular licensure, and after an agreed-on minimal period of employment, be free to move elsewhere for clinical practice.

Malpractice Insurance

Malpractice insurance issued by state-regulated insurers has several functions: to compensate patients harmed through negligent physician conduct; to incen-

tivize physicians and organizations to promote good outcomes; and to insure physicians judged responsible for producing harms against personal financial losses. Nearly all physicians have malpractice insurance, either because their state requires it for licensing (a minority of states), because it is required for hospital privileges or participation in physician groups (universally the case), or because physicians desire to limit their financial liability in the event of malpractice settlements.

Most physicians with more adverse events have higher insurance premiums, referred to as experience rating. While some specialties and localities have access to providers affected by high cost of insurance, this has a limited effect on physician supply overall (Mello 2005).

Malpractice insurance companies gather information about physician performance, mostly related to malpractice suits and outcomes, and provide this to state licensing boards and hospital privileging committees. Some insurers are more proactively involved in quality and safety initiatives. 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 (Svorny 2011).

The Effect of Payment Systems

The US spent approximately $3.6 trillion on health care in 2018, 18% of gross domestic product (HHS 2018), 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). When health-care payments are driven by government and third parties, education and workforce needs are influenced by the priorities of public officials, agencies, and program administrators, as well as by insurers and incumbent providers acting through regulatory and political processes.

If health-care payment evolves to be more directed by consumers, education and workforce needs would likely be increasingly influenced by where, when, and how consumers choose to spend their health-care dollars. If, for example, more consumers paired high-deductible catastrophic insurance with large health savings accounts (HSA), provider and facility types would accelerate to meet changing consumer demands, including increased sensitivity to cost. New models could emerge to cater to patient preferences, one example being direct primary care (Eskew and Klink 2015).

The Effect of New Technologies

New technologies are transforming medicine or are on the brink of doing so, including new diagnostic and therapeutic devices, surgical procedures, drugs, in-

formation systems (such as biosensors, applications of artificial intelligence, and telemedicine), and more. Professional organizations and medical educators may welcome such technologies or adopt a defensive pose. Technologies should be assessed on their merits for patient care, not on their effects on professional interests.

For example, telemedicine enables virtual visits with patients, locally or across vast distances, reaching areas with provider shortages and offering convenience and potentially lower cost. Despite these benefits, resistance arises because the technology creates unwanted competition. The AMA has asked states to adhere to current practice laws for telemedicine encounters and has supported laws requiring physicians to be licensed in the state where the patient is located (Farouk 2016). To justify such resistance, the profession typically invokes concerns over safety, quality, or threats to the patient-physician relationship, and seeks to limit the adoption of telemedicine by lobbying, forcing application of rules designed for the old paradigm, or thwarting reimbursement. State licensing laws create another roadblock for telemedicine by restricting the ability of doctors to see patients "across state lines."

Machine learning and artificial intelligence (AI) comprise another domain where beneficial technology might evoke resistance from the organized profession. One article on this subject stated that "The complexity of medicine now exceeds the capacity of the human mind," with the authors adding that "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).

AI technology has potential to revolutionize how diagnoses are made, increasing accuracy and speed while decreasing costs. Optimistic proponents predict computers will eventually replace many human providers, while others see AI complementing medical professionals and broadening the scope of unsupervised practice for nonphysicians. When the day comes that AI performance reaches or exceeds human equivalence in selected domains, we should be wary of self-serving protectors of the status quo.

Paths to Enhancement

Today's health provider workforce is the result of a complex mix of organizational, regulatory, and sociologic factors, many operating without transparency and poorly understood by the public. Many aspects of the current workforce are suboptimal, and beneficial change, whether in response to projected shortages, pressures to reduce cost and increase quality, introduction of new technologies,

or all of these, requires understanding the too often obscure controlling factors and their interactions.

Practically speaking, promoting an enhanced supply of qualified providers requires working within the existing framework of government regulators and private organizations that now control these issues, largely on behalf of the professions. A future goal should be to reduce the monopoly control these organizations exert, which limits innovation and preserves incumbent advantages. To facilitate this goal, we must be unafraid to point out circumstances where the preferences of the profession conflict with needs of the public and to support policies that prioritize the public's interest.

Enhance the Supply of Qualified Physicians

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

We encourage the LCME to articulate an intention to accredit schools that embrace diverse education models and seek to produce diverse types of graduates. This includes schools whose primary goal is educating frontline providers, while others continue to specialize in educating graduates—some of whom might excel in research, policy, and leadership.

We encourage the LCME to endorse paths to shorter and less expensive medical education.

We encourage the LCME to embrace competence-based and time-variable approaches to medical education. Similar approaches should be applied to GME training. These are more desirable than the process-based measures that now dominate physician assessment; through the use of big data, they should become possible to implement. As their predictive ability is confirmed, this will 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 that might be better incentivized to create educational efficiencies, paying close attention to the quality of the physicians they produce.

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

We encourage new mechanisms by which highly qualified (and fully clinically trained) IMGs can become eligible for licensure without ECFMG-required residency retraining, or a change in state board requirement of this ECFMG policy, or both. Provisional licensure under the aegis of a hospital or health system might 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, without a change in national ECFMG policy.

We encourage removing barriers that prevent qualified IMGs from eligibility to gain licensure in the US, such as incentivizing 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.

Increase the Supply and Involvement of Non-Physician Providers

There will be an increased need for nonphysician providers, namely NPs and PAs, to provide optimal health care to the public. In just 50 years, responding to clearly expressed demand from consumers and providers, these two professions went from nonexistence to a workforce nearly 40% the size of today's total MD and DO workforce. The goal 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:

- Increasing the number of states granting NP independence from physician oversight;
- Encouraging development and utilization of competency-based approaches to enable increased scope of practice for NPs and PAs; and
- Developing pathways for currently unlicensed categories of providers (such as health coaches, community health workers, and community paramedics) to deliver care as effective extenders of licensed professional providers.

Enhance the Adoption of New Technologies

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. 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 AI 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"; and
- Being open to the paradigm of "permissionless innovation," whereby innovators, early adopters, and experts test and endorse new technologies with less government preapproval than required today (Cerf 2012; Thierer 2016), relying more explicitly on the judgment of decentralized organizations like integrated health systems or academic health centers.

Conclusion

Health providers—MDs, DOs, NPs, PAs, and emerging types of unlicensed providers—are critical to the nation's health. It is therefore critical 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 health-care system. The system for educating, licensing, and credentialing providers has evolved, but this ecosystem today is excessively complex and nontransparent and involves many interlocking organizations. Organized medicine plays an excessive role in determining its own future state, and because public accountability is limited, it is difficult to innovate and produce beneficial change. As a result, neither the supply nor the quality of the provider workforce have kept pace with changing needs and opportunities.

Despite unavoidable 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 now underserved. This will most likely require educating more physicians in the US and licensing more graduates of international schools; the latter will entail changes to current licensing requirements. In the US, physician training should become shorter, less costly, more steeped in modern technology and pedagogy, better 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 is both inevitable and appropri-

ate. Creative approaches to innovation in these areas should be facilitated, while countering efforts to thwart their development based on narrow professional interests or unintentional regulatory gridlock.

As we seek to evolve a health-care system with improved access, cost, and quality, we should not underestimate the importance of an invigorated health provider workforce 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 changes, we see the future as being very bright.

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