Gaps in the Supply of Physicians, Advance Practice Nurses, and Physician Assistants

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BACKGROUND: Based on the goals of health care reform, growth in the demand for health care will continue to increase the demand for physicians and, as physician shortages widen, advanced practice nurses (APNs) and physician assistants (PAs) will play larger roles. Together with physicians they constitute a workforce of "advanced clinicians." The objective of this study was to assess the capacity of this combined workforce to meet the future demand for clinical services.

STUDY DESIGN: Projections were constructed to the year 2025 for the supply of physicians, APNs, and PAs, and these were compared with projections of the demand for advanced clinical services, based on federal estimates of future spending and historic relationships between spending and the health care labor force.

RESULTS: If training programs for APNs and PAs grow as currently projected but physician residency programs are not further expanded, the aggregate per capita supply of advanced clinicians will remain close to its current level, which will be 20% less than the demand in 2025. Increasing the numbers of entry-level (PGY1) residents by 500 annually will narrow the gap, but it will remain >15%.

CONCLUSIONS: The nation faces a substantial shortfall in its combined supply of physicians, APNs, and PAs, even under aggressive training scenarios, and deeper shortages if these scenarios are not achieved. Efforts must be made to expand the output of clinicians in all 3 disciplines, while also strengthening the infrastructure of clinical practice and facilitating the delegation of tasks to a broadened spectrum of caregivers in new models of care. (J Am Coll Surg 2011; xx:xxx. © 2011 by the American College of Surgeons)

As the United States adapts to health care reform, it confronts a series of future uncertainties. How much health care will there be, who will pay for it, who will receive it, and who will provide it? Of particular importance to physicians is the last; will there be enough doctors to provide the necessary care?[1] This question is especially germane to surgeons, whose numbers are projected to fall short of the future needs for surgical care[2,3] not only in general surgery,[4] where projected shortages are severe, but in specialties such as oncologic and orthopaedic surgery, where the demand for services continues to increase.[5,6]

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During the past several decades, others who provide first-contact care have shared care, to an increasing degree, that was once the exclusive province of physicians.[7,8] Therefore, in assessing the adequacy of the future physician workforce, we broadened our analysis to include other licensed and regulated health professions that have the prerogatives to see a patient without referral and to make and communicate a diagnosis with or without physician supervision. Excluding dentists, psychologists, and clinical social workers, there are only 7 such disciplines.[9] The majority are either advanced practice nurses (APNs) or physician assistants (PAs), and optometrists, podiatrists, and practitioners of alternative and complementary medicine constitute the rest.[10] Together with physicians, these other licensed disciplines constitute a workforce of approximately 1.0 million clinicians, 90% of whom are physicians, APNs, or PAs. Our study considered these 3 disciplines as a single, albeit varied, workforce of "advanced clinicians" who will carry out a definable range of tasks and responsibilities.[11]

To gauge the future supply of physicians and other advanced clinicians against the future demand for services, we drew on projections of health care spending that were

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Abbreviations and Acronyms

APN = advanced practice nurse
GDP = gross domestic product
NP = nurse practitioner
PA = physician assistant
PGY = post-graduate year of residency

framed by federal planners and leading economists during[12-14] and after[15,16] the recent enactment of health care reform legislation. It is important to note that these projections of spending are not expressions of need; instead, they are estimates of the actual demand for services, ie, how much care society is likely to purchase. Historic trends show that growth of the health care labor force closely tracks actual growth in health care spending, although physician supply grows more slowly than the labor force overall, as tasks are delegated to lesser-trained individuals.[17,18] We used these historic trends to translate projections of spending to projections of the future demand for physicians and other advanced clinicians.

Before presenting our findings, it seems useful to ask if the future demand for physicians can even be measured. Many commentators reject such exercises out of hand, citing past failures. As described in previous publications,[1,19] there has been a long history of failure, from the Graduate Medical Education National Advisory Committee Report in 1980 through the many reports of the Council on Graduate Medical Education into the late 1990s. However, these all used methodologies based on time and task approaches in which the existing work of physicians was disaggregated into its various components and projected forward into an unknown future of medical care. In 1999, Cooper supplanted this approach with the trend model based on underlying economic dynamics.[20] This model accurately foretold the current shortages[21] at a time when it was widely believed that surpluses were instead imminent.[22] In the years that followed, it was further developed[17,18] and subsequently adopted by both the Council on Graduate Medical Education[23] and the Association of American Medical Colleges,[24] which also projected deepening shortages of physicians. The current exercise uses this same approach.

METHODS

Who was counted

We counted patient care physicians, both MD and DO, excluding residents, as enumerated in the AMA's Physician Characteristics.[25] Physicians in nonclinical roles (research, administration, and teaching) were excluded, although some provide clinical services. We viewed this volume of service to be balanced by the decreased service provided by physicians in clinical roles who worked between 20 and 45 hours but, in the AMA system, are categorized as full-time.

APNs were defined according to the *National Sample Survey of Registered Nurses* for 2004 and 2008[26,27] and included nurse practitioners (NPs), clinical nurse specialists, nurse midwives, and certified registered nurse anesthetists. Only APNs employed in clinical nursing were included. The percentages of nurses employed in clinical care for each of the 4 APN disciplines were obtained from the National Sample Surveys.[26,27] Averaged for both surveys and across all categories of APNs, 73% were employed in clinical nursing, most with job titles reflecting their advanced degrees. Of those who were not, 15% were engaged in instruction or management and 12% were not employed in nursing.

Estimates of the numbers of PAs for the years 1991 to 2008 were obtained from the American Academy of Physician Assistants,[28] as reported by Hooker and colleagues.[29] We did not distinguish the work effort of clinicians in the various disciplines, but for purposes of this exercise considered them to be equivalent. All data are expressed in per capita terms, drawing on estimates from the US Census Bureau.[30]

Estimating the input of new clinicians

To estimate the input of new physicians, we created 3 models based on changes in the numbers of post-graduate year-1 (PGY-1) residents without earlier training: no change from the base year 2007; annual increases of 500 (approximately 2%) beginning in 2012; and annual increases of 1,000 (4%) beginning in 2012. The latter rate would double capacity during the next 20 years, a rate of growth that exceeds even the rapid growth during the 1970s and 1980s[31] and is unlikely to be accommodated by either hospitals or training programs today. Baseline residency numbers for 2007 were obtained from the annual survey of Graduate Medical Education.[32]

Estimates of the input of new NPs, clinical nurse specialists, nurse midwives, and certified registered nurse anesthetists were derived from recent trends in graduation reported by the American Association of Colleges of Nursing.[33] These data predict an increase of approximately 300 (3%) new graduates annually, 85% of whom will be NPs and clinical nurse specialists. As an alternative high-enrollment model, we assumed that graduation rates would increase by 500 (5%) annually, although this rate of growth, which would increase capacity by >50% during the next decade, exceeds the likely availability of faculty preceptors and clinical training sites. In accord with the current composition of the APN workforce, we assumed that 15% of new graduates would undertake careers in

instruction or management and that 12% would not actively participate in nursing. We also assumed that the recent shift from masters to doctoral-level NPs would not influence the numbers of NP graduates.

PA enrollment data from 1984 to 2009 and estimates of future enrollment were obtained from the Physician's Assistant Education Association[34] and the Accreditation Review Commission for Physician Assistant Education.[35] Based on these data, we projected that PA enrollment rates, which doubled during the past decade, would increase by 350 (5%) in 2011 and continue to increase thereafter, but at a decreasing rate, declining to 100 new graduates in 2025. As an alternative high-enrollment model, we assumed that PA graduation rates continually increase, from an additional 350 graduates in 2011 to 500 additional graduates (7%) in 2020, although, as in nursing, growth of faculty and training sites is likely to preclude such a rate of expansion. Although we have modeled high output growth in the production of new clinicians at rates of 4% for physicians, 5% for APNs, and 7% for PAs, it is extremely unlikely that these growth rates will be attained, and they are modeled only for purposes of illustrating an upper limit.

Primary and specialty care

The term *primary care clinician* was applied more narrowly than is the custom. It refers to those clinicians who are engaged in office-based primary care practices because it is the range of services that they provide that planners and the public associate with primary care. Physicians who had been trained as generalists but practiced in specialties such as sports medicine or as hospitalists or nocturnists were counted as nonprimary care specialists, as were emergency physicians, intensivists, and physicians in other hospital-based roles. Physician in obstetrics and gynecology were counted as nonprimary care specialists, while nurse midwives and geriatricians were counted as primary care clinicians, based on the predominant clinical roles of each. Certified registered nurse anesthetists were counted as specialists. Because our statistical demarcations were more rigid than the realities of clinical practice, the results must be viewed as estimates rather than precise measures of the distribution of primary and specialty clinicians.

For each physician growth model, we created 3 scenarios for the relative numbers of physicians entering primary care (as defined here) and specialties: 50% primary care and 50% specialties, 33% primary care and 67% specialties, and 25% primary care and 75% specialties. Based on recent trends in NP career choices,[32] we assumed that 67% of NP graduates would be engaged in office-based primary care and 33% in specialties. Similarly, drawing on recent PA graduation trends,[28,29] we assumed that 33% of new PAs would enter practice in primary care and 67% in the medical and surgical specialties.

Attrition

The attrition of physicians from clinical practice was derived from an analysis of the numbers of physicians in decanal age groups and the numbers of residents entering the workforce.[19,26] Based on data from 1986 through 2008, it was assumed that 6% of residents would enter nonclinical careers and that among those in clinical practice, 1% of those younger than 35 years would not enter the 35- to 44-year-old cohort, 4% of those aged 35 to 44 years would not enter the 45- to 54-year-old cohort, 9% of those aged 45 to 54 years would not enter the 55- to 64-year-old cohort, 34% of those aged 55 to 64 years would not enter the 65+ cohort, and attrition would be 10% annually for those aged 65+. The AMA data used in making these estimates has been reported to undercount younger physicians and overcount older physicians to approximately the same degree,[36] but we did not adjust it to reflect this discrepancy. Similarly, we did not adjust for the decreasing number of hours worked by physicians.[37] The errors associated with each of these are in the direction of overestimating physician supply.

Attrition rates for APNs were derived by applying the Census Bureau's *Labor Force Participation Rates for Professionals*[38] to the age distribution of APNs, as reported in the National Sample Survey of Registered Nurses for 2004 for all individuals with an RN degree employed in nursing.[26] Age distributions were not available in the 2008 survey.[27] Although APNs tend to be older than all RNs, the age distribution of the latter was used, which biases the data to overcounting APNs in clinical nursing.

Attrition of PAs was modeled from data on the numbers of PAs in clinical practice and the numbers graduating annually during the period from 1991 to 2001.[28,34] The best fit was an attrition rate of 2.5% in 1991, increasing by 0.1% annually. This model, which estimates attrition for all reasons (death, retirement, alternative careers), correctly predicted the supply of PAs employed in clinical practice during the subsequent period from 2001 to 2009.

Spending and demand

The future demand for health care was derived from 2 exercises. The first, which replicated an earlier model,[18] related future health care spending and the demand for physician services to future growth in GDP. This model assumes that for every 1.0% growth in inflation-adjusted GDP, the demand for physician services will grow by 0.5%. GDP was extrapolated at a growth rate of 4.4%, which is its historic average.

In the second, health care spending was extrapolated based on the goals of health care reform, which called for growth to decline from its historic level of 2.5% above GDP to 1.0% above GDP between 2010 and 2020. Current health care expenditures were obtained from Centers for Medicare and Medicaid Services[39] and adjusted for the Medical Care Consumer Price Index, which adjusts for price inflation in both commodities (ie, drugs, equipment, and supplies) and services.[40] Future health care spending assumed that the Medical Care Consumer Price Index would be 5.3%, which was its average during the period from 1986 to 2006 and is almost double the urban Consumer Price Index.

RESULTS

Health care reform and future demand for physicians

In 2009, the United States spent almost $2.5 trillion on health care, 17.2% of its GDP.[41] Based on projections by the President's Council of Economic Advisors[12] and the Congressional Budget,[13] per capita health care spending will be 65% greater in 2025 than in 2009 and will account for 25% of GDP. Reducing the rate of growth of health care spending from its historic average of 2.5% above GDP to 1.0% above GDP would delay by a full 20 years the date at which health care would account for 25% of GDP. However, because GDP grows, it would delay by only 8 years the time until health care spending grew by 65%, and this delay would be only 6 years if health care spending grows at a rate of 1.5% above GDP, as projected recently.[14] By 2030, per capita health care spending is likely to be 65% greater in constant dollars than today. Some of this increase will be a result of higher costs of new technologies, but most will result from growth in the quantity of beneficial services.[42] Beneficial services are expected to grow faster than spending overall, as the added costs of new services are balanced by decreased reimbursement per unit of service.[14]

What does this mean for the providers of service? Between 1990 and 2005, during which GDP increased by 56% and health care spending by 85% in constant dollars,[43] the labor force in physicians' offices, including nursed, technicians and others, increased by 66%[44] and physician supply increased by 44%. Similar relationships between GDP, health care spending, health care labor force, and physician supply were chronicled during the longer period from 1929 to 2000[17,18] and were drawn on to project the demand for physician services that is shown in Figure 1. This projection of demand corresponds to the projection of demand that was derived from estimates of future health care spending growth at a rate of 1.5% above GDP. Figure 1 also illustrates the lesser demand that would occur if health care spending grew at only 1.0% above GDP and the greater demand that would occur if it continued at 2.5% above GDP.

Figure 1. Physicians, health care spending, and the demand for physician services. The lower set of curves displays the historic supply of patient care physicians and projections of physician supply under circumstances of no change in the numbers of PGY1 residents, increases of 500 annually and increases of 1,000 annually beginning in 2012. The upper set displays historic health care expenditures and projections under circumstances of expenditure growth at a level 2.5% greater than the growth of the gross domestic product (GDP) (the historic level), 1.5% greater and 1.0% greater, adjusted for the Medical Care Consumer Price Index (CPI). A calculated estimate of the demand for physician services (–■–■–■–), derived from earlier work,[17,18] tracks the middle expenditure curve. All estimates are expressed in per capita terms. Dollar figures are in constant 1990 dollars. Data are displayed as a percent of 1990. The period of physician surpluses is designated as "Turn of the Century Bulge."[45]

How do these estimates of demand relate to the projections of supply? Between 1990 and 2008, the supply of physicians closely tracked both the calculated demand and the actual adjusted expenditures, except for the period from 1996 to 2004 when there was a transient surplus of physicians, which is represented as the "turn-of-the-century bulge" in physician supply that was projected a decade earlier.[45] After 2006, physician supply and demand diverged sharply, creating a current physician shortage of approximately 8.0%, which corresponds to many current market perceptions.[21] If the rate of residency training is not increased, supply and demand are projected to diverge more over time, leading to a potential physician shortage of >20% in 2025.

If instead, residency training is increased by 500 PGY1 positions annually beginning in 2012, the gap between supply and demand could narrow to 18% in 2025, and it would narrow further, to 14%, if PGY1 positions grew by 1,000 annually. Expressed as numbers of physicians, there would be a gap of 214,000 physicians in 2025 if residency training does not increase, 178,000 if training capacity is increased by 500 annually, and 138,000 if it increased by

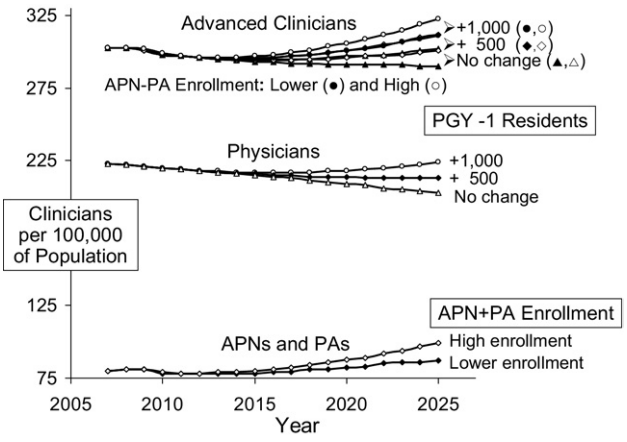

Figure 2. Physicians and advanced clinicians. The lower set of curves displays the per capita supply of advance practice nurses (APNs) and physician assistants (PAs) under conditions of lower enrollment, similar to current trends, and a high trend alternative. The middle set displays the per capita supply of patient care physicians under circumstances of no change in the numbers of PGY1 residents, increases of 500 annually and increases of 1,000 annually beginning in 2012. The upper set combines these to display the combined workforce of advanced clinicians at 3 levels of PGY-1 and 2 levels of APN + PA enrollment.

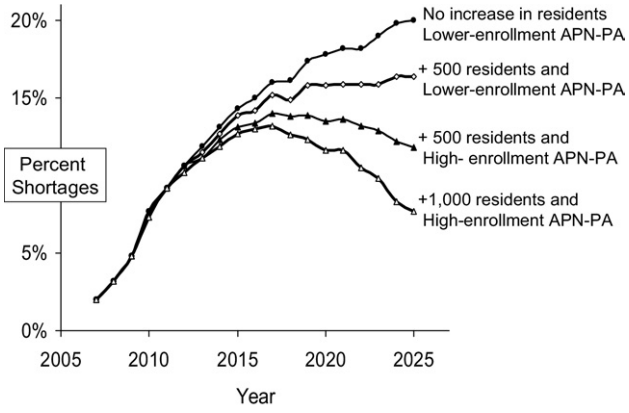

Figure 3. Physician shortages under various training scenarios. Differences between the number of advanced clinicians (from Fig. 2) and the demand for physician services (from Fig. 1) are expressed as a percent of physician supply under circumstances of varying levels of residency training and advance practice nurses (APNs) plus physician assistants (PAs) enrollment.

1,000 annually. Under each of these scenarios, the projected shortages would narrow by approximately 5.0% if the rate of spending were constrained from GDP + 1.5% to GDP + 1.0%, but only if this decrease in spending was on the basis of decreases in the volume of service and not on the basis of lower reimbursements per unit of service. Conversely, the projected shortages would widen by an additional 8% in 2025 if spending growth was closer to the historic rate.

Advanced clinicians

Figure 2 displays projections of the supply of physicians, APNs plus PAs, and the combined supply of all 3 disciplines (advanced clinicians) during the period from 2007 to 2025, expressed in per capita terms. Results are shown for 3 levels of physician training (no change and increases of 500 and 1,000 PGY1s) and for 2 levels of education for APNs and PAs (lower enrollment, as forecasted from current trends, and a high-enrollment alternative).

In 2007, there were 303 advanced clinicians per 100,000 of population, 35% more than the number of physicians alone. After a lag of a few years because of the lack of growth of NP enrollment between 1997 and 2007,[33] the number of APNs plus PAs is projected to slowly increase. However, per capita physician supply will decline, even if 500 additional PGY1 residents were trained annually. Combining these 2 trends, the supply of advanced clinicians would return to the 2007 baseline by 2025 under the lower-enrollment scenario for APNs and PA, and it would exceed the baseline by approximately 3% if APN plus PA training followed the high-enrollment scenario. Increasing physician training by 1,000 PGY1 positions annually would increase the total supply of advanced clinicians by 3% in 2025 under the lower-enrollment scenario for APNs plus PAs and by 8% under the high-enrollment scenario. This latter estimate of 8% growth by 2025 appears to be the maximum that could reasonably be expected from the educational resources in these 3 disciplines, although it is unlikely to be achieved. Rather, under the most likely scenarios of APN plus PA training, and with an additional 500 PGY1 residents annually, the per capita supply of advanced clinicians will be the same in 2025 as it is today.

Estimates of shortages

Figure 3 displays the projected shortages of advanced clinicians under 4 of the many permutations of physician, APN, and PA training scenarios, expressed as a percent of the demand for physician services. The scenario that combines 500 additional PGY1s annually and lower enrollment levels for APNs and PAs, which we believe is achievable, would result in long-term shortages of approximately 15%, double the current level of shortage. If PGY1 positions remained unchanged, which is not likely, these shortages would exceed 20% (upper curve). Conversely, the gap could narrow to 12% if increases in PGY1s of 500 positions annually were coupled with high enrollment of APNs and PAs, and narrow still more if PGY1s increased by 1,000 annually, neither of which is likely. Each of these estimates of shortage is based on growth in health care spending at 1.5% above GDP, which has been cited as most likely.[14,16]

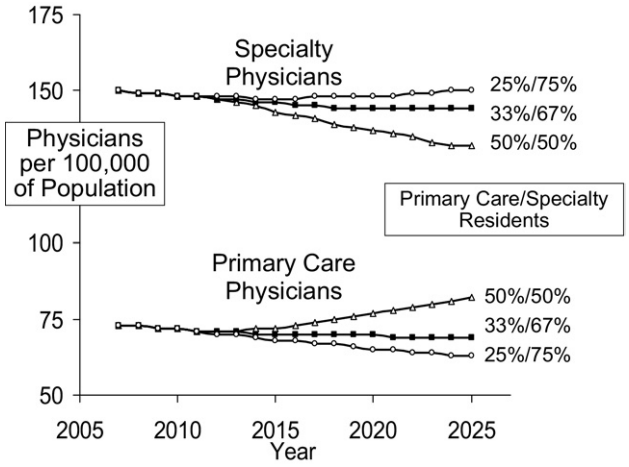

Figure 4. Primary care and specialty physicians. The supply of primary care and specialty physicians is displayed under circumstances of an increase in the number of PGY1 residents of 500 annually and various percentages of residents entering careers in primary care and specialties.

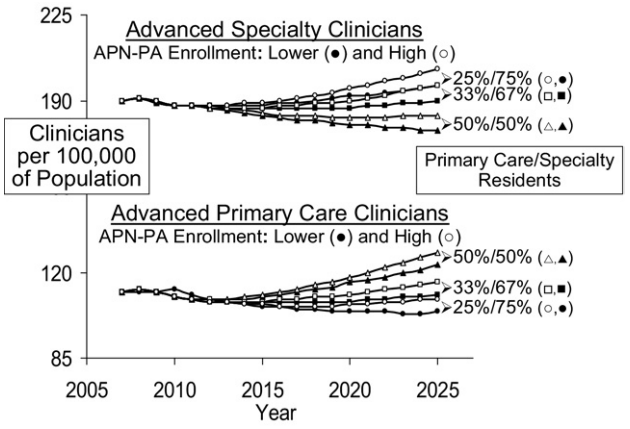

Figure 5. Primary care and specialty advanced clinicians. The supply of primary care and specialty advanced clinicians (physicians + advance practice nurses [APNs] + physician assistants [PAs] is displayed under circumstances of an increase in the number of PGY1 residents of 500 annually, lower or high APN + PA enrollment and various percentages of residents entering careers in primary care and specialties.

As indicated here, slower growth, if related to lower volumes of service, could narrow the gap by as much as 5.0%, and faster growth would widen it.

Primary care and specialty physicians

Primary care has been highlighted as an arena of special concern. Figure 4 displays the numbers of primary care physicians and specialists under the middle physician growth scenario (500 additional PGY1 residents annually), with various percentages of residents entering primary care and specialties and both low and high growth rates for APNs and PAs. If one-third of all residents enter office-based primary care, the supply of primary care physicians in 2025 would be relatively unchanged from today, at 70 per 100,000, which is within the historic range.[46] This static supply would be accompanied by a small decline in the supply of specialists. Increasing the proportion of physicians entering primary care to 50% would elevate the supply of primary care physicians beyond the historic range, and further decrease the supply of specialists. Conversely, shifting the balance to 25% primary care and 75% specialists would hold specialist supply flat, and cause a progressive contraction of primary care supply to levels well below its historic range.

Primary care and specialty advanced clinicians

The projections of primary care and specialty physicians in Figure 4 are of statistical interest, but they do not reflect the realities of the workforce to which APNs and PAs also contribute. The combined workforce of advanced clinicians is depicted in Figure 5. As in Figure 4, this portrays the circumstances under which the number of PGY1 residents would increase by 500 annually.

In 2007, there were 190 advanced specialty clinicians and 112 advanced primary care clinicians per 100,000. If residency training is increased by 500 PGY1s annually, with 33% of residents entering office-based primary care, and if the training of APNs and PAs proceeds at the lower enrollment rate, the supply of advanced primary care and specialty clinicians will be similar to today's supply in 2025. If instead, 50% of residents enter primary care and 50% enter specialties, the per capita supply of advanced primary care clinicians would be 10% greater, and specialty supply would decrease by 6%. Conversely, changing the mix to 25% primary care and 75% specialties would diminish the supply of advanced primary clinicians by 7%, and increase the supply of specialists by 3%. Increasing the training programs for APNs and PAs to the high-enrollment level would yield marginal increases in each scenario. With a 33% and 67% mix of primary care and specialty residents, both primary care and specialty clinicians would increase by 3% in 2025; but with a 50% and 50% mix, primary care would increase by 14% and specialist supply would decline by 3%; and with 25% and 75% mix, primary care supply would decrease marginally and specialist supply would increase by 7%. Although meaningful, these variances in supply are small in proportion to the large gap between supply and demand overall.

DISCUSSION

In 2004, Cooper concluded, "physician shortages are emerging and they will probably worsen over the next two

decades. By 2020 or 2025, the deficit could be as great as 200,000 physicians—20% of the needed workforce."[1] The current exercise reassesses this conclusion in the context of health care reform and in consort with measures of the supply of APNs and PAs, whose scope of practice broadly overlaps that of physicians.[11] Its results are not radically different. Even under optimistic circumstances, the per capita supply of advanced clinicians will not be substantially different in 2025 than it is today, and it will be less than today during most of the intervening years. In the meantime, demand, as estimated from the economic goals of health care reform, will continue to grow and the number of clinicians to fill that demand will grow even beyond our projections when gender and lifestyle factors are considered.[37] It seems possible that, with maximal effort, supply could keep up with increases in demand from here forward but it will not be possible to close the existing gap, and if residency positions are expanded <2% annually it will not even be possible to keep up. The most likely scenario is one of flat supply in the face of rising demand, leading to long-term shortages of advanced clinicians of approximately 15%, double the current level.

We limited this exercise to physicians, APNs, and PAs because they are most directly involved in the delivery of what patients recognize as physician services. Together they constitute 7% of the entire health care labor force[44] and almost 90% of licensed and regulated first-contact clinicians. We considered them together, although their training and prerogatives differ, but so do the training and practices of physicians in various specialties. In addition, although the work effort of APNs and PAs is generally assumed to be less than that of physicians, we did not differentiate effort among disciplines, nor did we differentiate physician effort in relation to age or sex. Therefore, our projections should be considered as maximum estimates of supply. We did not separately consider other professionals whose scope of practice overlaps those that we assessed, such as dentists, pharmacists, psychologists, clinical social workers, physical therapists, and complementary providers. However, we are not aware of workforce changes that will materially affect the supply-and-demand relationships reported.

Our demand projections were built from authoritative estimates of future health care spending.[12-16] Although there are likely to be short-term economic fluctuations, these projections create a long-term planning framework that has some validity and mirrors the planning framework used in the process of health care reform. The transformation of spending projections to the demand for physician services is based on previous econometric studies.[17,18] It is confirmed by the strong relationship we observed between demand, as calculated in this manner, and projections of health care spending after adjustment for the prices of labor and materials, which approximate the volume of service. However, we did not consider the decreasing number of hours worked by physicians[37] or the increasing number of those hours devoted to documentation, compliance, and other nondirect patient care services by all clinicians. These could increase the demand for advanced clinicians by an additional 10% to 15%.

Of the various supply assumptions, those for APNs and PAs are the most secure because both disciplines are in established growth phases. Given the limitations of faculty and clinical training sites that APN and PA training programs face, the lower-enrollment scenario is most likely and the high-enrollment scenario seems beyond reach.

Estimates of growth in physician supply are more uncertain. Although medical school capacity has been increasing,[47] the limiting factor in the growth of physician supply is residency positions, which have increased episodically through the decades.[31,32,48] During the last period of medical school expansion in the 1970s, PGY1 positions in residencies approved by the ACGME grew an average of 5.5% annually.[31] However, when medical school expansion abruptly ceased in 1979, residency growth ceased for a decade. It was not until 1989 that growth resumed, although it was at half the earlier rate. However, this growth abruptly ceased in 1996, coincident with the Balanced Budget Act of 1997, which capped the number of residency positions supported by Medicare.[31] After a 6-year pause, residency growth resumed again in 2001 at an apparent rate of approximately 2.0% annually,[49] although the inclusion of osteopathic physicians in ACGME statistics and similar factors accounted for as much as half of this apparent growth. Some of the real growth resulted from added positions in Veterans Affairs hospitals, but most was in nonfederal hospitals with support from the hospitals. It is uncertain if this will continue under the reimbursement pressures of health care reform.

Other avenues for growth in residencies exist. A recent congressional bill would have added support for 15,000 residency positions at all levels (approximately 3,500 PGY1 positions), enough to finance Medicare's portion of growth at 2.0% annually for 7 years, but it was not enacted. However, if shortages deepen, Congress might be more willing to act. There also is a body of opinion that some residencies could be shortened.[50] During the 1970s, PGY1s accounted for 30% of all residents, but by 1990 this had dropped to 22%, where it remains today. This is equivalent to a lengthening of residencies from an average of 3.5 years in 1970 to 4.5 years. Shortening residencies by an average of 6 months would free up enough positions to permit a 10% growth in PGY1s.

So far, federal efforts to ameliorate physician shortages have been directed toward increasing the proportion of physicians who choose primary care or general surgery, both through the Recovery Act and the Affordable Care Act. However, it will be difficult for physicians in any discipline to discharge their responsibilities without adequate numbers of physicians overall.

The conventional alternative has been to include more NPs and PAs, not only in primary care but in specialty practices as well.[11] What is apparent is that APNs and PAs are necessary to sustain the workforce in both primary care and the specialties, but not sufficient to compensate for the growing shortages of physicians in both. The reason lies in the math: more than two-thirds of advanced clinicians are physicians and, in per capita terms, the nation is training fewer each year. Although the supply of APNs and PAs is growing in percentage terms, such increases contribute proportionately less to the aggregate supply of physicians plus APNs and PAs.

CONCLUSIONS

What must the nation do? First, the supply of all 3 disciplines that constitute the workforce of advanced clinicians must be maximally expanded, but that will not be enough. Parallel efforts must be made to strengthen the infrastructure of clinical practice and to broaden the spectrum of health care workers who can assist in delivering services. Finally, the future roles of physicians must be squarely addressed. It seems inevitable that in the coming era of shortages, physicians must be directed toward those elements of practice that demand the direct participation of physicians most. The lack of adequate numbers of surgeons and others who bring unique skills to the care of patients will cripple the system no matter how else it is staffed.

Even before health care reform, the nation was headed for serious physician shortages and reform has only made it worse. Without an adequate supply of highly skilled generalist and specialist physicians, the fundamental goals of health care reform cannot be achieved and the health of the nation will be at risk.[51] These realities must be at the forefront of the health care agenda.

Author Contributions

Study conception and design: Sargen, Hooker, Cooper
Acquisition of data: Sargen
Analysis and interpretation of data: Sargen, Hooker, Cooper
Drafting of manuscript: Sargen, Hooker, Cooper
Critical revision: Sargen, Hooker, Cooper

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