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THE CARE SPAN

An Aging Population And Growing Disease Burden Will Require A Large And Specialized Health Care Workforce By 2025

ABSTRACT **As the US population ages, the increasing prevalence of chronic disease and complex medical conditions will have profound implications for the future health care system. We projected future prevalence of selected diseases and health risk factors to model future demand for health care services for each person in a representative sample of the current and projected future population. Based on changing demographic characteristics and expanded medical coverage under the Affordable Care Act, we project that the demand for adult primary care services will grow by approximately 14 percent between 2013 and 2025. Vascular surgery has the highest projected demand growth (31 percent), followed by cardiology (20 percent) and neurological surgery, radiology, and general surgery (each 18 percent). Market indicators such as long wait times to obtain appointments suggest that the current supply of many specialists throughout the United States is inadequate to meet the current demand. Failure to train sufficient numbers and the correct mix of specialists could exacerbate already long wait times for appointments, reduce access to care for some of the nation's most vulnerable patients, and reduce patients' quality of life.**

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The growing elderly population in the United States, accompanied by the increasing prevalence of chronic diseases associated with aging, will have profound implications for the health care system for decades to come. By 2050 the US population ages sixty-five and older is projected to reach 89 million—more than double the 40.5 million elderly people in 2010.[1,2] The proportion of Americans ages sixty-five and older who reported having one or more chronic diseases rose from 86.9 percent in 1998 to 92.2 percent in 2008. This trend is likely to continue, since the combination of increased longevity and high rates of obesity points to increasing prevalence of chronic disease.[3]

Between 2010 and 2030 there will probably be an additional twenty-seven million Americans with hypertension, eight million with coronary heart disease, and three million with heart failure.[4] Studies projecting the prevalence of diagnosed diabetes differ in their estimates. One study estimates that between 2010 and 2020 the population with diagnosed diabetes will increase by more than 80 percent, from 21 million to 37.9 million, and by 2030 it will increase 164 percent, reaching 55.5 million.[5] A separate study projects substantially slower growth in the prevalence of diagnosed diabetes (86 percent growth between 2009 and 2034).[6]

The population with Parkinson's disease is projected to increase by 30 percent between

2010 and 2020 and to increase by 68 percent between 2010 and 2030.[7] Approximately 5 million of the 5.2 million Americans in 2013 with Alzheimer's disease are ages sixty-five and older; by 2025 the elderly population with Alzheimer's is projected to increase by 40 percent, to 7.1 million.[8] The National Cancer Institute projects that by 2020 there will be 18.1 million cancer survivors (30 percent more than in 2010).[9]

Primary care providers will play an important role in providing preventive services and caring for this growing elderly population. However, the expansion of medical knowledge and treatment options for these diseases and others has contributed to a proliferation of medical and surgical specialties and subspecialties. More than one-third of patients are referred to a specialist annually, and these specialists play essential roles in the diagnosis, treatment, and monitoring of patients afflicted with diseases and adverse medical events.[10]

Many health care providers just entering the workforce are likely to be active in patient care through 2050. Understanding the health care needs and projected demand for services by the aging population can help inform decisions about the number and mix of providers that the nation should train to achieve the goals of improved access, high quality, and affordable care. This article forecasts future demand for health care services and providers based on projected changes in demographic characteristics and other predictors of health care use and on the estimated impact of expanded medical coverage under the Affordable Care Act.

Study Data And Methods

The Health Care Demand Microsimulation Model used for this analysis simulates disease prevalence and use of health care services by medical specialty and care delivery setting (physician's office; hospital, for outpatient or inpatient care; and emergency department, or ED) for each person in a representative sample of the current and projected future population. Projected demand for health care services provides the basis for projecting demand for physicians under various assumptions about key trends in demand determinants and care delivery patterns. Information on the microsimulation model has been published elsewhere.[11,12] The online Appendix provides additional details on the model and our data, methods, assumptions, and findings.[13]

The model uses the following three major components to use in estimating demand for full-time-equivalent providers: the population database, prediction equations for health care use, and care delivery patterns.

POPULATION DATABASE The population database contains demographic and socioeconomic characteristics, insurance type, health-related behavior, and presence of chronic health conditions for each person in a stratified random sample of the population in each state. We created this database using a statistical matching process that combined demographic and socioeconomic data from approximately three million individuals in the Census Bureau's 2011 American Community Survey; health data from more than one million individuals in the combined 2010 and 2011 files of the Behavioral Risk Factor Surveillance System, which covers the noninstitutionalized US population; health data from 13,500 residents in the 2004 National Nursing Home Survey; and Census Bureau population projections.[14]

To model demand for health care services (via regression analysis described later), we used the following information for each individual in this population database: age, sex, race or ethnicity, residence in a metropolitan area, household income level, type of health insurance, diagnosis of one or more selected chronic conditions, body weight, and smoker status.

HEALTH CARE USE PREDICTION EQUATIONS Health care–seeking behavior was modeled through regression analysis using data from approximately 170,000 participants in the combined 2006–10 files of the Medical Expenditure Panel Survey (MEPS). Explanatory variables consisted of personal characteristics common to both MEPS and the population database we created, with patients' characteristics coded as dichotomous variables. We used Poisson regression to estimate the relationship between personal characteristics and annual ambulatory care visits—with separate regressions estimated for children and adults—by office and outpatient setting and by physician specialty (see the Appendix for examples of the regression results).[13]

For hospitalizations and ED visits, MEPS provides no information on medical discipline or specialty of the providers who care for the patient. Using logistic regression, we quantified the relationship between a patient's characteristics and whether he or she had a hospitalization or an ED visit during the year for each of twenty-six categories of medical conditions (such as diseases of the circulatory system, diseases of the respiratory system, and diseases of the digestive system) based on the *International Classification of Diseases*, Ninth Revision (ICD-9), primary diagnosis code.

To model length-of-stay for patients who were hospitalized, we used Poisson regression with

discharge records for more than eight million hospital stays in the 2010 Nationwide Inpatient Sample. Length-of-stay for each condition category was the dependent variable. Explanatory variables were patients' characteristics common to both the Nationwide Inpatient Sample and MEPS.

Applying these estimated prediction equations to the population database, we calculated each person's expected annual use of health care services by provider type and care delivery setting. Combining information on hospitalization risk and length-of-stay per hospitalization, we computed expected inpatient days during the year by medical condition for each person.

We calibrated the model by comparing predicted and actual national estimates of health care use by provider type, medical condition category (for ED and inpatient care), care delivery setting, and adult or child population.

PATTERNS OF CARE DELIVERY Demand for providers derives from the demand for health care services. Under a baseline (or status quo) scenario, we first estimated the proportion of time that physicians in each specialty currently spend providing care to patients by setting. This allowed us to estimate how each patient encounter in a particular setting, on average, translated to a fraction of a full-time-equivalent provider. To calculate average annual patient encounters per provider and provider time spent providing patient care in different settings and for different patient care activities, we used data from multiple sources. These included the Medical Group Management Association's Physician Compensation and Production Survey,[15] the American Board of Internal Medicine's Practice Characteristics Survey (61,758 board-certified physicians were surveyed between January 2006 and February 2010),[16] the American Medical Group Association's 2011 Medical Group Compensation and Financial Survey,[17] the Centers for Medicare and Medicaid Services' files on work relative value units,[18] and provider-specific surveys.[19,20]

We calibrated the model so that its projected national demand for physicians matched the American Medical Association's estimated supply in 2010.[21] There was one exception: We calibrated the national estimates for general and family practice and general internal medicine to replicate the current national shortfall of approximately 7,500 providers, so that the estimates would be consistent with the current federally designated primary care Health Professional Shortage Areas.[22]

MODELING EXPANDED INSURANCE COVERAGE The Congressional Budget Office estimates that the Affordable Care Act could result in medical coverage for an additional twenty-five million people by 2016 and an additional twenty-eight million by 2023.[23] Provisions in the act will mean that approximately 92 percent of nonelderly legal residents will have insurance by 2023, compared to a projected 82 percent in the law's absence.[24] Because states have leeway in implementing the Medicaid expansion, the ultimate magnitude and timing of the impact of expanded medical coverage is uncertain.

The American Community Survey contains data on US citizenship status, which we used as a proxy for legal resident status. Using logistic regression analysis with MEPS data, we calculated the probability that each adult (those ages 18–64) is currently insured based on household income, demographic characteristics, health risk factors, and presence of chronic conditions. We used the regression coefficients to calculate probabilities of becoming insured for the currently uninsured people in the population database we constructed. We assumed that uninsured people with the highest calculated probability of becoming insured were representative of those likely to obtain insurance under the Affordable Care Act. To determine how many people in each state would become insured under the act, we used published estimates for each state.[25]

We assumed that people who gained coverage would have patterns of care similar to those of their privately insured peers with the same demographic and socioeconomic characteristics and same health risk factors. The increase in demand for services, therefore, reflected the difference in health care use for two otherwise identical individuals, one currently uninsured and one privately insured.

Study Results

The Census Bureau projects that the US population will grow by 9.5 percent between 2013 and 2025 (Exhibit 1), with the population ages sixty-five and older projected to grow by close to 45 percent.[14] The growth and aging of the elderly population will be accompanied by increased prevalence of the chronic diseases and medical conditions included as predictors of health care use in our model. The portion of the population with cardiovascular disease and the portion with a history of stroke or heart attack are projected to increase by close to 27 percent between 2013 and 2025. The population with diagnosed diabetes is projected to grow by 21 percent.

In the absence of changes in care delivery patterns, one would anticipate that demand for specialist physicians would grow at approximately the same rate as the portion of the population with the chronic conditions treated by

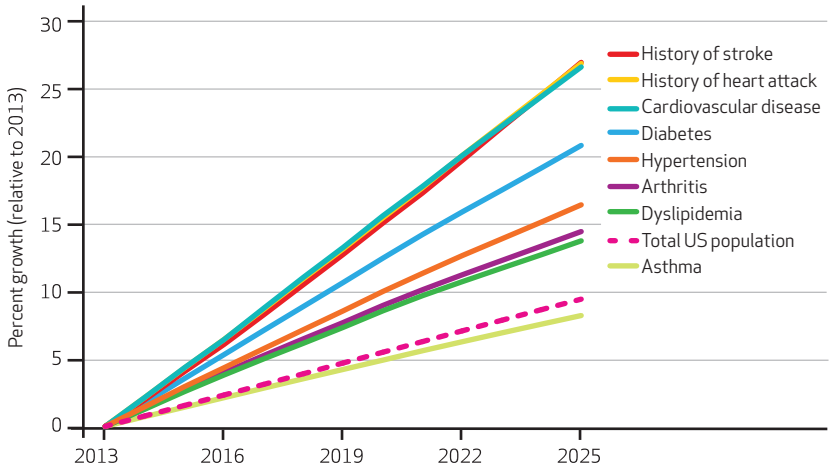
8–12%

Increase

The total number of office visits, outpatient visits, and emergency department visits is projected to increase by approximately 8–12 percent between 2013 and 2025.

EXHIBIT 1

Projected Growth In Population With Chronic Conditions, 2013–25



SOURCE Health Care Demand Microsimulation Model projections.

each specialty. That is, demand for cardiologists would grow at approximately the same rate as the population with cardiovascular disease, and demand for endocrinologists would grow at about the same rate as the growth in prevalence of endocrine disorders.

PROJECTED SERVICE DEMAND At the national level, the total number of office visits, outpatient visits, and ED visits is projected to increase by approximately 8–12 percent between 2013 and 2025. Total hospital inpatient days are projected to increase by approximately 19 percent during this period, reflecting the more complex health care needs of the growing elderly population and the higher rates of surgery and hospitalization among this population.

Taking into account the expected effects of both changing demographics and expanded medical coverage, between 2013 and 2025 the projected growth in specialty service demand is substantial. For example, the number of both cardiology and rheumatology office visits is projected to increase by 18 percent (Exhibit 2). Urology and neurology visits are projected to increase 17 percent, and dermatology visits by 16 percent. In comparison, adult primary care office visits are projected to increase by 14 percent.

Expanded medical coverage under the Affordable Care Act is projected to increase demand for most medical specialties by only a few percentage points. If health insurance coverage increases by the levels forecast by the Congressional Budget Office,[23] then specialties in our analysis with the largest projected increase in office visits from expanded coverage would be otolaryngology (5.2 percent more visits), urology (5.0 percent), dermatology (5.0 percent), gastroenterology (4.7 percent), ophthalmology (4.3 percent), and rheumatology (3.8 percent). In comparison, adult primary care specialties (general and family practice and general internal medicine) are projected to experience about a 2 percent increase in office visits as a result of expanded coverage.

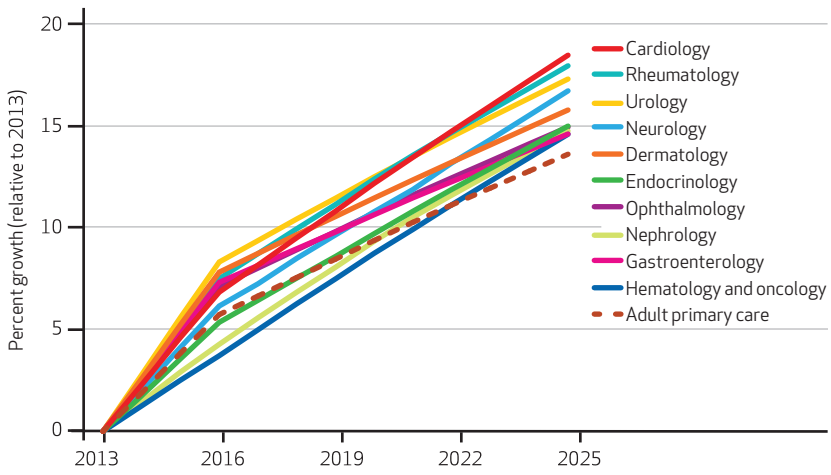
Although these percentage increases are relatively small at the national level, the impact on access to physician services could be substantial for people living in already underserved communities. In addition, demand growth in some geographic areas could drain physician supply from underserved areas.

The specialty-specific impact of expanded medical coverage would differ by care delivery setting. Some specialties would also see mixed impacts in different care delivery settings. For example, endocrinology is projected to experience a 2.2 percent increase in office visits, which would be offset by a 5.8 percent decline in outpatient or clinic visits as access to care for populations traditionally served in outpatient settings is broadened through expanded coverage. Emergency consultations and hospital inpatient days in cases where diabetes is the primary diagnosis (based on ICD-9 codes) are projected to decline by 4.2 percent and 1 percent, respectively, as a result of expanded medical coverage.

PROJECTED DEMAND FOR PHYSICIANS BY SPECIALTY If patterns of use and delivery of care remained relatively unchanged, between 2013 and 2025 the demand for primary care physi-

EXHIBIT 2

Projected Growth In Office Visits To Physicians In Selected Medical Specialties, 2013–25



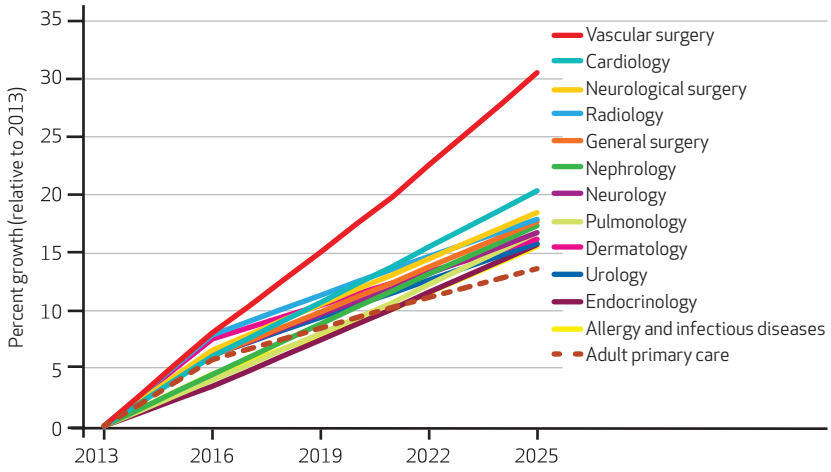
SOURCE Health Care Demand Microsimulation Model projections.

cians (including geriatricians) to serve the adult population would grow by approximately 14 percent (Exhibit 3). Twelve of the specialties modeled have projected growth rates in demand for full-time-equivalent providers that are equal to or greater than that for adult primary care physicians. Vascular surgery has the highest projected demand growth, at 31 percent, followed by cardiology, at 20 percent. In comparison, projected growth for general pediatrics during this period is 6 percent (reflecting the Census Bureau's projected low growth of the US child population).

The projected growth in demand for specialist services varies substantially by state, reflecting variation across states in population growth, demographic characteristics, economic factors, and the expansion of health coverage. For example, although demand for cardiologist services is projected to increase by 20 percent at the national level between 2013 and 2025, the projected increase in demand ranges from 5 percent in West Virginia to 51 percent in Nevada. Likewise, growth in demand between 2013 and 2025 for vascular surgery ranges from 12 percent in Iowa to 63 percent in Arizona.[26]

EXHIBIT 3

Projected Growth In Demand For Full-Time-Equivalent Physicians In Selected Specialties, 2013–25



SOURCE Health Care Demand Microsimulation Model projections.

Discussion

The growth of the US elderly population portends rising prevalence and incidence of complex diseases and medical conditions that historically have been treated by specialist physicians. Our projections of the increase in demand for health care services and physicians reflect what will likely occur in the absence of paradigm shifts in use and delivery of care. The projections incorporate the estimated impact of expanded coverage under the Affordable Care Act.

POTENTIAL CHANGES IN CARE USE AND DELIVERY PATTERNS Medical and technological advances have the potential to change utilization and delivery patterns of care for patients with certain types of medical conditions. However, such advances can lead to increased demand for services and providers (for example, new treatment options) as well as to reduced demand (such as cures for chronic conditions). The increased use of value-based insurance design and efforts to make patients and providers more cost-conscious might reduce demand for services with lower demonstrated value while increasing demand for services with higher demonstrated value.[27]

Expanding the scope of practice of allied health professionals—to include services that currently require a physician's supervision but that evidence demonstrates can be safely performed by nonphysicians—could help meet increased demand for both primary care and specialty services. This would make more highly trained specialist physicians more productive by allowing them to focus on more clinically complex services and procedures.[28]

Emerging care delivery models also have the potential to change the number and mix of providers required to provide the level of services demanded. Risk-bearing organizations, such as managed care organizations and accountable care organizations (ACOs), and patient-centered medical homes are designed to promote greater preventive care and management of chronic conditions in ways that would shift care delivery from specialists to primary care providers and allied health professionals, and from expensive EDs and hospitals to more appropriate outpatient settings.[29]

The Affordable Care Act includes provisions to encourage the development of ACOs and patient-centered care. ACOs are designed to create incentives and develop accountability metrics that will improve the affordability and quality of care. ACOs typically incorporate a patient-centered medical home model, in which primary care providers coordinate patient care across specialty providers and care delivery settings. Demonstrations of new ACO models are ongoing, and there is still a dearth of published information on what their impact will be on demand for specialists. Still, one can examine the premise of ACOs to illustrate how they might affect demand for specialists.

For example, electronic data collection and the use of predictive software allow ACOs to identify

patients with chronic conditions who are at high risk for emergency care or hospitalization and refer them to disease management programs. Diabetes, congestive heart failure, chronic obstructive pulmonary disease, and asthma are conditions often targeted for management. Published outcomes of disease management programs vary substantially, depending on the intensity of program services, the target population, how well the program was implemented, and the design of the study evaluation.[30,31] However, many programs report improvements in patient outcomes, including reductions in numbers of hospitalizations and ED visits.

One example is a study of Medicare Advantage enrollees that found that a telephone management intervention delivered by nurses reduced hospitalizations and ED visits for all-cause encounters and in cases where diabetes was the primary diagnosis.[32] The authors estimated that, relative to the comparison group, participation in the intervention reduced diabetes-related hospitalizations by a significant 37 percent and diabetes-related ED visits by 29 percent (although that reduction was not significant).

If this intervention result for hospitalizations could be achieved across the entire population with diabetes, taking into account the proportion of endocrinologist resources devoted to hospital care, we estimate that the national demand for endocrinologists would decline by approximately 280–340 full-time-equivalent providers—a reduction in overall demand for endocrinologists of approximately 4–5 percent (for additional details on our calculations, see the Appendix).[13] This example illustrates the potential for shifting patterns of use and delivery of care to reduce the demand for specialist services.

Interviews with neurologists for a recent workforce study suggest the possibility that under an ACO model with a patient-centered medical home, neurologists might play more of a consultative role in patient care management.[12] Under such a model, a larger portion of neurology services might be provided by primary care providers, nurse practitioners, and physician assistants who would interact directly with a neurologist. Neurologists would play an important role in the diagnosis process, with nurse practitioners playing a larger role than they now do with patients receiving follow-up visits.

Such a scenario could decrease the demand for neurologists. However, a substantial national investment would be required to address the resulting shortfall of nurse practitioners and other clinicians trained to care for patients with complex neurological disorders.

STUDY STRENGTHS AND LIMITATIONS This study used a new approach to workforce modeling that has the potential to provide more reliable projections of how changes in health care use and delivery (such as expanded Medicaid coverage) will affect demand for health care services and providers. A comparison of our approach to approaches used in other studies is provided in the Appendix.[13] For example, the use of a microsimulation approach allowed us to estimate the impact of obtaining medical insurance on potential demand, controlling for health-related behavior and the presence of medical conditions that affect the need for care. In addition, the use of detailed health, demographic, and socioeconomic information about a representative sample of the population in each state can improve the reliability of state-level demand estimates and reflect geographic differences in prevalence of chronic conditions and health-related behavior. Another strength of our approach is the use of large and relatively recent national databases on population characteristics, patterns of health care use, and provider productivity.

Still, like all workforce projection models, our approach has limitations related to data and methodology. One limitation is the use of historical data to project future patterns of use and delivery of health care. There is a paucity of information on how emerging care delivery models and changes in technology will affect these patterns. Many providers have overlapping scopes of practice (such as general internists who provide care to patients who might otherwise be referred to a specialist), and the role of midlevel providers continues to evolve. Trends in demand determinants such as obesity prevalence appear to have stabilized after decades of increases, but these trends could change over time. Demand projections are especially sensitive to paradigm shifts in the delivery of care.

A second limitation is that the data sources on productivity that we used—such as the Medical Group Management Association's data[15]—may not be representative of all physicians. A third limitation is that medical claims data analyzed for hospital and emergency care lack information on what types of providers cared for patients during their stays. These unknowns and other limitations indicate areas for future research and highlight the need to continually improve the data sources and methods that support research and policy analysis.

MARKET INDICATORS OF SPECIALIST SHORTFALLS The number of specialists required to provide appropriate care for the US population continues to be debated. Many argue that the country has reached a saturation point for some specialties, with intensive treatment options being overused to the point at which medical

14%

Increase in demand

The demand for primary care physicians to serve adults would rise 14% between 2013 and 2025 if patterns of use and care delivery remained the same.

costs have been driven up yet overall population health has not improved.[33–35]

However, there are some indications that the supply of providers in many specialties and locations is inadequate to meet the demand for services. For example, patients often experience long wait times to see a specialist. In 2012 the average wait time to see a neurologist was 34.8 business days for a new patient visit and 30.0 days for a follow-up visit.[20] In a 2009 survey the average wait times for new patient visits were 27.5 days for a routine gynecological exam with an obstetrician/gynecologist, 22.1 days for a skin exam with a dermatologist, 16.8 days for orthopedic surgery for knee injury or pain, and 15.5 days for a heart checkup with a cardiologist.[36] And in 2010 the average wait time to see a neurosurgeon for a nonemergency visit was 24.1 days.[37] The average wait time in 2009 was 20.3 days for a routine physical with a family practitioner—indicating that there are challenges accessing primary care as well as specialist services.[36]

Although this article focuses on the growth in demand for specialty care associated with the growing elderly population, there are also indications that the supply of specialists to treat children is inadequate. In 2012 average wait times for appointments at sixty-nine children's hospital clinics among selected specialties for children were even longer than for adults: 51 days for endocrinology, 52 days for child and adolescent psychiatry, 54 days for dermatology, 55 days for rheumatology, 62 days for neurology, 76 days for genetics, and 101 days for developmental pediatrics.[38] This survey also reported shortages of select pediatric specialists that affected the hospitals' ability to deliver pediatric care, most notably in neurology, developmental pediatrics/behavioral medicine, gastroenterology, general surgery, neurosurgery, emergency medicine, genetics, child and adolescent pschiatry, endocrinology, and pulmonology.

Another indication of inadequate supply is that many providers are unwilling to accept new Medicaid patients. This reluctance suggests that physicians are sufficiently busy that they can choose which patients to see based on how well they are likely to be reimbursed for services.[36]

Conclusion

The disease burden associated with a growing elderly population will require a large and diverse health care workforce that can effectively and efficiently diagnose and treat patients with complex medical conditions. Just as specialization in nonmedical professions has contributed to increased productivity, advances in technology, and improved quality of life,[39] specialization in medicine has expanded treatment options and provided physicians with the volume of cases to remain proficient in their area of expertise.[40,41]

Thomas Bodenheimer and coauthors have observed that the management of the growing burden of chronic disease will require multidisciplinary teams.[42] We believe that specialists will be a key component of such care delivery teams and that their roles will be clearly defined as part of evidence-based care plans. Failure to train sufficient numbers of specialists could exacerbate already long wait times, reduce access to care for some of the nation's most vulnerable patients, and reduce patients' quality of life. ■

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