

TRENDS

Will Generalist Physician Supply Meet Demands Of An Increasing And Aging Population?

Projected shortages could be alleviated if the United States produced four additional generalist graduates in each family and internal medicine residency program each year.

by Jack M. Colwill, James M. Cultice, and Robin L. Kruse

ABSTRACT: We predict that population growth and aging will increase family physicians' and general internists' workloads by 29 percent between 2005 and 2025. We expect a 13 percent increased workload for care of children by pediatricians and family physicians. However, the supply of generalists for adult care, adjusted for age and sex, will increase 7 percent, or only 2 percent if the number of graduates continues to decline through 2008. We expect deficits of 35,000–44,000 adult care generalists, although the supply for care of children should be adequate. These forces threaten the nation's foundation of primary care for adults. [*Health Affairs* 27, no. 3 (2008): w232–w241 (published online 29 April 2008; 10.1377/hlthaff.27.3.w232)]

THE U.S. POPULATION is growing, aging, and reaping the rewards of advancing medical technology. These trends increase the use of health care and raise concerns about a future physician shortage. The Association of American Medical Colleges (AAMC) now recommends increasing medical school class sizes by 30 percent, based on the above factors as well as on the rising demand historically associated with economic growth and concern that U.S. overdependence on international medical graduates (IMGs) is causing a physician “brain drain” from third-world countries.¹ Others, however, point out that physician supply varies widely across the country and that increasing

supply is directly associated with higher spending without evidence of better care.²

In this paper we focus on the adequacy of the future supply of generalist physicians. These physicians in family medicine (FM), general internal medicine (GIM), and general pediatrics (GPed) are the foundation of U.S. health care, providing 52 percent of all ambulatory care visits, much inpatient care, 80 percent of patient visits for hypertension, and 69 percent of visits for both chronic obstructive pulmonary disease (COPD) and diabetes.³

Numbers of generalist residency graduates have declined each year since 1998, causing concern about future shortages. This study, we believe, is the first to measure the potential

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primary care shortfall, addressing supply and demand for primary care separately for adults and children.

Study Methods And Results

■ **Future workload.** The U.S. population is expected to increase 18 percent between 2005 and 2025, to 349 million. During the same period, the population above age sixty-five will increase 73 percent. This group seeks care from generalists almost three times per year—twice the rate of those under age sixty-five.⁴

Because the majority of generalist physicians' effort is in ambulatory care, we used ambulatory care visits from the National Ambulatory Medical Care Survey (NAMCS) as a proxy for workload (derived demand), and we assumed that effort in other activities such as hospital care would increase in parallel fashion.⁵ The NAMCS data do not include hospital-based generalists or those practicing in other settings, such as industry. We assumed that generalist effort in such settings increases proportionately to that of office-based settings. Nurse practitioners and physician assistants (NP/PAs) participated in some of these visits; their numbers were assumed to remain proportionate to physician supply.

From combined 2003–2005 NAMCS data, we estimated annual office visits per patient to each generalist specialty, stratified by age. Using Census Bureau population projections, we estimated total annual visits for adults and children through 2025.⁶

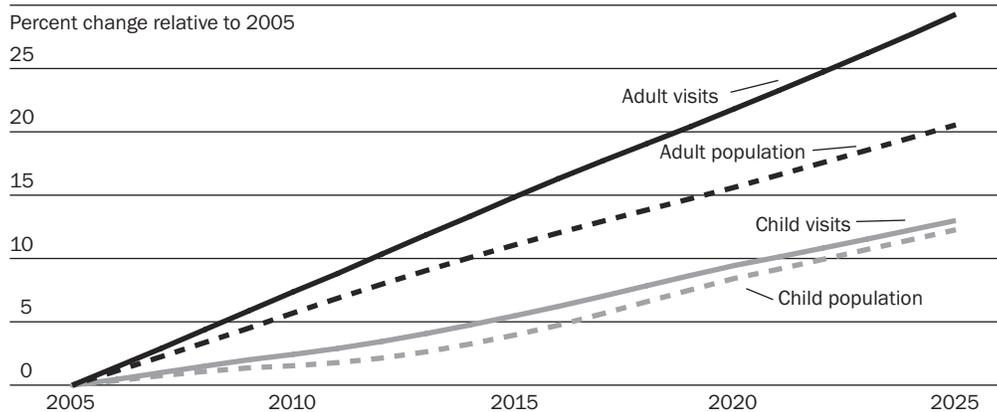
The Census Bureau projects that the population age twenty and older will grow 21 percent between 2005 and 2025. We calculated that ambulatory care visits will increase 29 percent as a result of the increasing proportion of elderly people (Exhibit 1). At the same time, the child population will rise 12 percent, and projected patient visits will increase 13 percent. Thus, we expect a 29 percent increased workload for adult care generalists and a 13 percent increase for child care generalists. Whether the future supply of generalists will increase to meet this workload will depend on numbers of graduates entering the workforce and on rates of attrition.

■ Numbers of generalist graduates.

Counting generalist graduates in IM and GPed poses a dilemma because large numbers of residency graduates become subspecialists, and others change specialties following residency. We assumed that all third-year residents in IM, FM, and GPed who do not become sub-

EXHIBIT 1

Percentage Change In Projected Population And Patient Visits Per Year, For Adults (Age 20 And Older) And Children (Up To Age 19), 2005–2025



SOURCES: Population data are from midlevel census projections, U.S. Census Bureau. Data on visits are from the authors' analysis of data from the National Ambulatory Medical Care Survey (NAMCS), combined 2003–2005 data.

NOTE: Patient visits are used as a proxy for workload (defined demand).

specialty fellows or switch to another specialty become generalists.⁷ The American Board of Internal Medicine (ABIM), American Board of Pediatrics (ABP), American Academy of Family Physicians (AAFP), and American Osteopathic Association (AOA) provided numbers of residents and fellows.⁸

Surveys indicate that 5 percent of pediatric residency graduates and 2.5 percent of family medicine graduates plan to enter another specialty.⁹ One-fourth of medicine/pediatrics (Med/Ped) graduates spend the majority of their effort in subspecialty practice.¹⁰ We reduced generalist graduates in these specialties by these percentages and, in the absence of other data, reduced GIM graduates by 2.5 percent as well.

Total graduate numbers increased in the early 1990s, reaching 9,348 in 1998; but by 2005 the number had fallen to 7,289—only 1 percent above the 1995 level. During the decade, the U.S. population grew almost 12 percent. The rise in the 1990s proved to be a “flash in the pan,” and declines continue.

Only FM experienced increases in graduate numbers, climbing to 3,305 in 2005—25 percent above 1995 levels (Exhibit 2). However, this masks a 40 percent decline in U.S. allopathic medical school graduates entering FM residencies—from 73 percent to 48 percent—

between 1998 and 2005. Recruitment of IMGs and osteopathic graduates (DOs) accounted for the increase. Osteopathic FM residencies provided 10 percent of FM graduates in 2005.

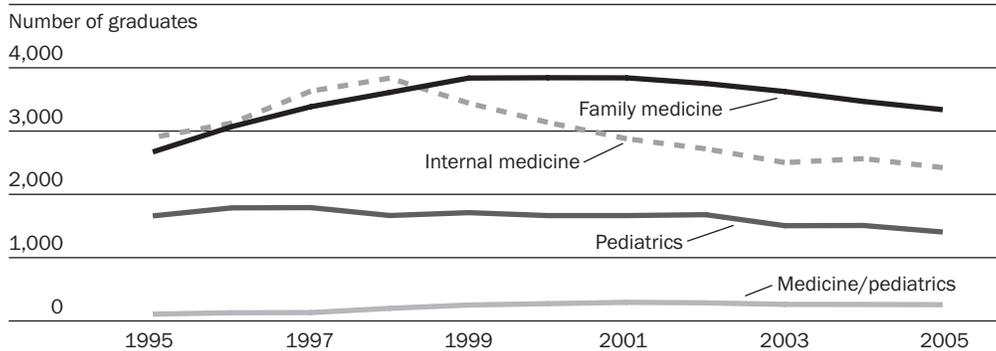
The trend in GIM graduates is downward. Residency programs produced 2,470 GIM graduates in 2005—16 percent below 1995 levels and 37 percent below the peak in 1998 (Exhibit 2). Much of the decline has been caused by increased subspecialization (from 52 percent in 1995 to 62 percent in 2005). IMGs totaled 53 percent of those entering GIM and 34 percent entering subspecialties.

Changes in GPed parallel those in GIM. Numbers of graduates fell 15 percent to 1,515 in 2005, and subspecialization rose from 27 percent in 1995 to 42 percent. IMGs totaled 20 percent of those entering GPed and 32 percent subspecializing. Graduates in Med/Ped more than doubled, but they constituted only 4 percent of generalist graduates.

■ **Projecting future generalist supply.**

With graduate numbers from above, we used the Health Resources and Services Administration’s (HRSA’s) Physician Supply Model (PSM), used by the Council on Graduate Medical Education (COGME) and by HRSA for workforce studies since 1990, to project future supply.¹¹ We focused on numbers of office- and hospital-based MD and DO generalists ob-

EXHIBIT 2
Number Of Generalist Physician Graduates, By Specialty, 1995–2005



SOURCES: American Academy of Family Physicians, American Board of Internal Medicine, American Board of Pediatrics, and American Osteopathic Association.

NOTES: Figures include both allopathic and osteopathic physicians. Generalist physician graduates are calculated as residency graduates minus first-year fellows and those changing specialties.

tained from the American Medical Association (AMA) Masterfile.

The Masterfile appears to overstate numbers of active physicians, probably because of underreporting of retirement by physicians.¹² NAMCS surveyors found that 11 percent of 9,000 sampled physicians who were reportedly active in the 2003–2005 surveys were actually retired, deceased, or unlicensed or had left the United States.¹³ Therefore, we reduced Masterfile numbers by 11 percent, excluding all above age seventy and an increasing proportion of those ages 50–70.

Beginning with 286,420 (96.9 per 100,000 population) active generalists in 2005, we excluded resident physicians (13.6 percent); those in teaching, research, and administrative roles (4.1 percent); and the 11 percent inactive physicians described above. We then added unclassified physicians, who tend to be recent graduates, for whom a specialty is known (4.4 percent). Thus, our projection model begins in 2005 with 222,275 office and hospital-based generalists (75 per 100,000).

In assigning new graduates to the workforce, we allocated half of Med/Ped graduates to GIM and half to GPed, and we assumed that half of IMG J-1 visa recipients (nonimmigrant exchange visitors) and all other IMGs practice in the United States.¹⁴ We used 1991–1993 rates of attrition by age, specialty, and sex, as used

by HRSA.

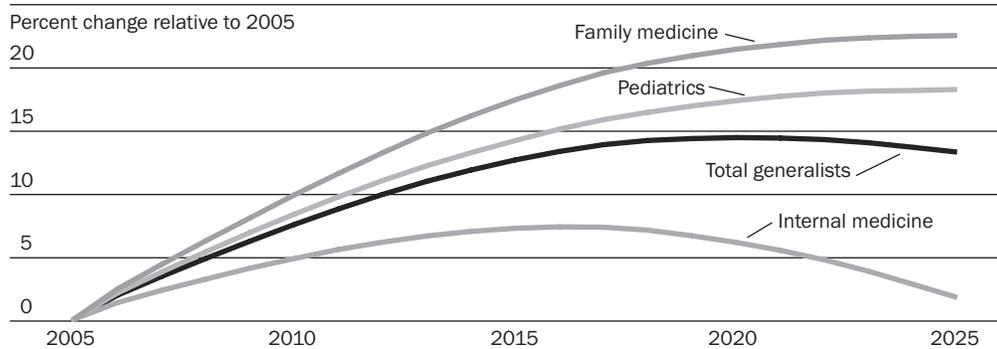
The unadjusted generalist supply will increase 13 percent by 2025 if graduate numbers continue at 2005 levels (Exhibit 3). Exhibit 3, however, masks important differences between the supply available for care of adults and that for children, and it does not adjust for age or sex.

■ **Generalist supply for adult care.** We estimated generalist effort devoted to adult and child care using pooled 2003–2005 NAMCS visit data for the three specialties. Ninety-six percent of GIM effort, 85 percent of FM effort, and 2 percent of GPed effort is devoted to adults age twenty or older. If proportional effort by each specialty continues, the unadjusted generalist supply for adults will increase 11 percent by 2025, assuming 2005 graduate numbers. At the same time, anticipated workload will increase 29 percent (Exhibit 4).

But an increasing proportion of older and female physicians will reduce the effective workforce. We predict that by 2025, half of the generalist supply will be female, with 43 percent in FM, 42 percent in GIM, and 70 percent in GPed. Using the PSM and data from the 1998 AMA Patient Care Physician Survey for hours worked by sex, age, and specialty, we calculate that the age- and sex-adjusted supply for adults will increase 7 percent by 2025.

Numbers of generalist graduates in FM and

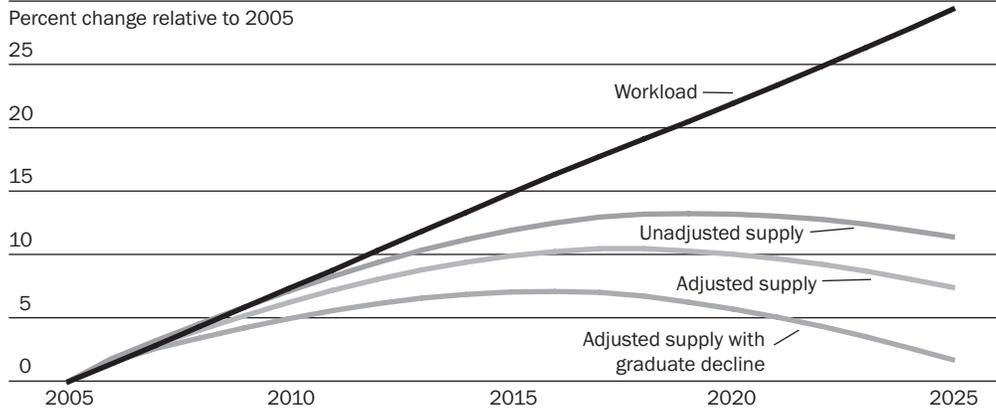
EXHIBIT 3 Projected Percentage Change In Number Of Generalist Physicians, By Specialty, 2005–2025



SOURCE: Authors' calculations using the Physician Supply Model, Bureau of Health Professions.

NOTE: Physician supply is unadjusted.

EXHIBIT 4 Care For Adults: Projected Percentage Change In Workload And Number Of Generalists, 2005–2025



SOURCES: Data on workload (visits) are from the authors' analysis of data from the National Ambulatory Medical Care Survey (NAMCS), combined 2003–2005 data. Data on supply are from the authors' calculations using the Physician Supply Model, Bureau of Health Professions.

NOTES: Adjusted supply denotes adjustment for age and sex. Graduate decline extends the 2002–2005 rate of decline in graduates through 2008.

GPed continued to decline in 2006 and 2007. Data for GIM are not final, but continued decline is likely. If the 2002–2005 rate of decline continues through 2008, the supply of generalists to provide adult care in 2025 will be only 2 percent above 2005 levels.

In the face of a 29 percent increase in workload, the adjusted supply figures point to a 20 percent shortage of adult care generalists in 2025, or 27 percent if graduate declines continue through 2008. These translate into shortfalls of 35,000–44,000 adult care generalists, assuming that generalists maintain current numbers of visits.

Only 5,774 residency graduates entered adult care practice in 2005. Using the PSM, we estimated that 2,800 additional adult care graduates would be required annually to eliminate the deficit in 2025, or 3,600 additional graduates if declines continue through 2008. With about 850 residency programs in FM and IM, 3.5–4.5 additional generalist graduates would be required annually from each program to eliminate the shortfall.

■ Generalist supply for care of children.

Based on analysis using the above methods, we expect that the adjusted generalist supply for

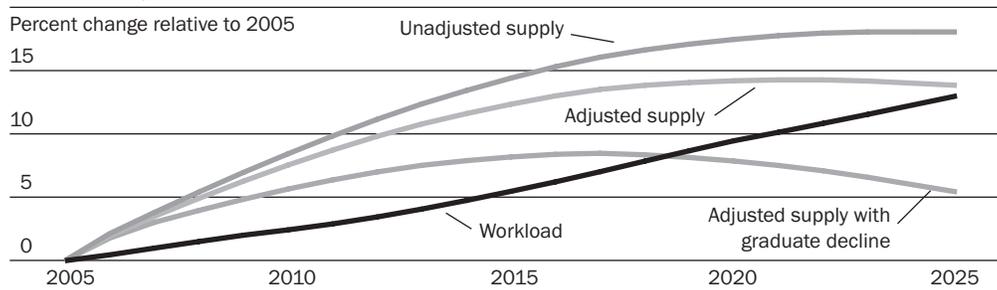
children will increase 14 percent by 2025, or 5 percent if current declines in GPed and FM continue through 2008 (Exhibit 5). With an expected 13 percent increase in utilization by 2025, we anticipate that supply and demand for children's generalist care will be approximately in balance.

Discussion

■ **Limitations and methodological considerations.** The physician workforce is not rigidly compartmentalized. Many subspecialists provide some primary care services, and many generalists focus on specific areas. Some classified as specialists do not complete fellowships and serve as generalists. We assumed that this would continue at current rates.

We also assumed that consumers will seek primary care services as they do today. Our shortage estimates will be low if the population increases more than projected, as occurred during the 1990s, and if universal coverage provides access for the uninsured. If per capita annual visits increase for middle-aged and older adults by 0.4 and 0.5 visits, respectively, as they did in the past decade, workload will be approximately 20 percent higher than

EXHIBIT 5 Care For Children: Projected Percentage Change In Workload And Number Of Generalists, 2005–2025



SOURCES: Data on workload (visits) are from the authors' analysis of data from the National Ambulatory Medical Care Survey (NAMCS), combined 2003–2005 data. Data on supply are from the authors' calculations using the Physician Supply Model, Bureau of Health Professions.

NOTES: Adjusted supply denotes adjustment for age and sex. Graduate decline extends the 2002–2005 rate of decline in graduates through 2008.

our estimate.¹⁵ Conversely, a generalist shortage, greater numbers of uninsured people, and higher out-of-pocket spending may reduce primary care utilization.

On the supply side, our sex and age adjustments might be low, since they were based on hours worked weekly and not adjusted for weeks worked annually and for productivity measures such as numbers of visits. Lifestyle changes could mean fewer hours worked and earlier retirement. For example, if generalists retired two years earlier, future supply would be reduced 5 percent. On balance, we believe that our estimates of shortage are conservative.

We estimated the accuracy of the PSM as a projection model by comparing its supply projections for U.S. medical school graduates from 1995 to 2005 with Masterfile figures for 2005. PSM projections were 1.4 percent below the Masterfile figures in 2005. Thus, using 1991–1993 rates of attrition, the PSM appears to provide reasonable projections.

Our supply projections are gloomier than those reported by HRSA in 2006.¹⁶ Its estimate of future demand is similar to ours, but HRSA projected a greater increase in generalist supply than we did. Its projections did not include recent declines in GIM graduates and did not adjust for unrecognized retirement. Scott Shipman and colleagues projected larger increases in pediatric supply than we did. They

used AMA data, while we used American Board of Pediatrics data, which indicate greater numbers of fellows.¹⁷

■ **Policy implications.** Generalist physicians are the foundation for health care in this country. Yet generalist specialties are the only major specialties that show a decade of declining numbers of graduates. Declines continue as population growth and aging drive use of primary care upward. Using 2005 levels as a benchmark, we anticipate a sex- and age-adjusted shortfall of 20–27 percent for care for adults. Supply increases for care for children should parallel workload increases through 2025, unless increasing numbers of graduates subspecialize.

The major decline is in GIM, as more IM graduates subspecialize. The decline in primary care delivery is even greater when one recognizes that almost a third of GIM graduates plan to be hospitalists.¹⁸ Although hospitalists relieve primary care physicians from inpatient duties, they also care for inpatients of surgical and medical specialists, thus reducing the effective primary care supply.

Some suggest that the shortfall might be reduced by increased physician efficiency, higher medical school enrollment, greater use of NP/PAs, and increased primary care by specialists. We believe that the combined impact of these factors will be inadequate.

To increase efficiency, patient visits might be shortened and return visits reduced, but access difficulties and brevity of visits frustrate patients. Physicians complain that time limitations make it impossible to follow recommended disease guidelines and preventive services. Although electronic medical records seem likely to improve the quality of care and reduce office overhead, little evidence suggests that they enable physicians to see more patients.

Expected MD and DO medical school enrollment increases of 5,000 students by 2012 will provide minimal generalist increases because of the seven-year educational pipeline and the small percentage likely to become generalists, and because most increases are not specifically targeted to increase the number of generalist graduates.¹⁹

The availability of more NP/PAs is also uncertain.

These practitioners' involvement in office-based practice appears modest today. In one study, 25 percent of office-based generalists worked with NP/PAs, but NP/PAs participated in only 11 percent of visits (NP/PAs apparently worked with multiple physicians in these settings).²⁰ Large health maintenance organizations (HMOs) employ only one NP/PA for every four to six generalists.²¹ Only in community health centers do numbers of NP/PAs approach two-thirds the number of physicians.²²

Probably fewer than half of NP/PAs are in office-based primary care. Large numbers work in emergency rooms (ERs), hospital clinics, intensive care units, and inpatient services. Our analysis of NAMCS data indicates that 42 percent of patient visits to NP/PAs in office-based practices are in offices of specialists—not generalists.

NP graduate numbers fell from 8,199 to 5,920 between 1998 and 2005 and may decline further as master's-level NP programs are replaced by clinical doctoral programs by 2015.²³ PA graduate numbers have remained stable at

about 4,200 for the past several years and can probably be expanded.²⁴ Thus, limited numbers of NP/PAs, lucrative alternative practice opportunities, and uncertain numbers of future graduates will likely limit their availability in primary care.

Specialists might provide more primary care, but they also face increasing demand and are less likely to perceive themselves as the patient's primary care physician than are generalists. Our analysis of 2001–2003 NAMCS data

“As workload increases, generalists in regions with greater supply may accept more patients, but elsewhere they will close their practices to new patients.”

indicates that generalists view themselves as the patient's primary care physician in 86 percent of visits, compared with 20 percent for IM subspecialists, 19 percent for obstetrician-gynecologists, and 4 percent for surgeons. Roger Rosenblatt and colleagues found that most specialists do not provide the full scope of primary care services for most patients.²⁵ Undoubtedly, specialists will continue

to provide some primary care, especially for patients for whom they provide the majority of care, but most are unlikely to have time or do not view this as their responsibility.

Today's generalist supply—approximately 75 per 100,000 population—is similar to that of group- and staff-model HMOs.²⁶ However, physician supply varies widely. Uniform distribution would do much to relieve shortages. But practice location is not easily modified; it depends heavily on attractiveness of the region, family location, spousal preferences, and place of education.

As workload increases, generalists in regions with greater supply may accept more patients, but elsewhere they will close their practices to new patients. Overworked physicians will place priority on patients' most urgent problems and be less able to provide comprehensive care. If a patient's problems are complex, the physician is likely to refer the patient to a subspecialist for diagnosis and management, relieved that the patient is no longer his or her responsibility. For complex patients, re-

ferral results in more referrals with follow-up by many specialists. Duplication of service occurs, and the patient might be uncertain which physician is “my doctor.” Problems are compounded in physician shortage areas, where one-fifth of the U.S. population resides. The downstream effect is likely to be further declines in students’ interest in primary care.

“Concierge medicine,” in which physicians provide comprehensive services for limited numbers of patients for a retainer fee, is a solution for some.²⁷ These physicians provide comprehensive acute and chronic illness care, and they guarantee patients rapid telephone, e-mail, and office access. As patients’ advocates, they coordinate care with specialists and may be more likely to obtain consultative assistance than to refer patients away. Lewis Sandy and Steven Schroeder suggest that this arrangement could become a “disruptive technology,” reshaping primary care but aggravating generalist shortages.²⁸

Studies of regional variation in medical care demonstrate that physicians in regions with greater supply provide more services at greater cost, but without demonstrably improved outcomes.²⁹ These studies also show that regions with higher proportions of generalists to specialists use fewer specialist services and have lower spending and somewhat better quality-of-care indicators. Other studies also show that strong systems of primary care are associated with better outcomes and lower costs.³⁰ These studies illustrate the need to strengthen the nation’s primary care base, but current trends lead in the opposite direction.

It is not surprising that fewer graduates are becoming generalists. Generalists’ income is less than half that of many procedurally oriented specialties, and income disparities are increasing.³¹ Further, education in inpatient-oriented tertiary care centers provides a powerful socializing influence toward specialization. Medical students perceive that generalists lack the leisure time enjoyed by many specialists, and huge educational debts may subtly divert graduates from primary care. Nevertheless, medical schools vary widely in the proportion of their graduates entering FM

and probably GIM and GPed. This variation is associated with schools’ commitment to education of generalists.³²

Each generalist specialty is sponsoring a model of primary care, the “medical home,” which may make practice more attractive for those frustrated by the inability to provide comprehensive care while on the urgent care treadmill. The “medical home” provides rapid access for acute problems and care management for chronic illnesses. Collaborative teams of physicians and NP/PAs provide office, hospital, and home care, using telephone and e-mail consultations and electronic medical records.³³ This can increase efficiency and quality of care, and also satisfaction for patient, physician, and team. It could provide system reform, reducing spending through greater coordination of care, reduced hospitalizations, and added emphasis on consultation rather than referral. However, shortages of generalists and NP/PAs will limit its applicability. Further, reimbursement reform is essential to realign incentives for primary care teams to provide more comprehensive care.³⁴

A version of the “medical home” concept, based on Family Health Teams and promoted by family physicians in Ontario, is being tested.³⁵ One million people have enrolled in these group practices, which are reimbursed by capitation with bonuses for illness severity and performance rather than fees for services rendered. It is hoped that this approach will improve access, improve chronic illness care, and reduce ER visits and hospitalizations.

OUR GOAL SHOULD BE to maintain or preferably increase today’s availability of generalists. It is in the best interests of the public and of all physicians. A number of interventions could advance these ends. Employers, insurers, and government as well as medical education have roles to play. Reimbursement reform realigning incentives to make the “medical home” financially viable should be at the top of the list. It has potential to increase job satisfaction for providers as it improves care. But at the same time, numbers of graduates must be increased. All avenues

must be tried to increase funding for residency positions for FM and GIM. Had graduate numbers remained at 1998 levels, the projected shortfall in 2025 would have been modest. Students' interest in generalist careers can be enhanced if medical schools renew their commitment to education of generalists as they did in the 1990s. Further, incentives such as forgiveness of loans for primary care practice would tip the scales for many medical students and residents as they select a specialty and type of practice.

Our findings predict a greater generalist shortfall for adult care than many anticipate. Without interventions, shortages of 35,000–44,000 generalists are likely by 2025, and shortages of NP/PAs are anticipated as well. The nation's primary care foundation is increasingly threatened, but shortages could be alleviated if interventions produced four additional generalist graduates in each FM and IM residency program annually. The time for vigorous action is now.

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