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## Downsizing the Physician Workforce

### SYNOPSIS

**Objective.** To estimate the need for downsizing the physician workforce in a changing health care environment.

**Methods.** First, assuming that 1993 physician-to-population ratios would be maintained, the authors derived downsizing estimates by determining the annual growth in the supply of specialists necessary to maintain these ratios (sum of losses from death and retirement plus increase necessary to parallel population growth) and compared them with an estimate of the number of new physicians being produced (average annual number of board certificates issued between 1990 and 1994). Then, assuming that workforce needs would change in a system increasingly dominated by managed care, the authors estimated specialty-specific downsizing needs for a managed care-dominated environment using data from several sources.

**Results.** To maintain the 1993 199.6 active physicians per 100,000 population ratio, 14,644 new physicians would be needed each year. Given that an average of 20,655 physicians were certified each year between 1990 and 1994, at least 6011 fewer new physicians were needed annually to maintain 1993 levels. To maintain the 132.2 ratio of active non-primary care physicians per 100,000 population, the system needed to produce 9698 non-primary care physicians per year; because an average of 14,527 new non-primary care physicians entered the workforce between 1990 and 1994, downsizing by 4829, or 33%, was needed.

To maintain the 66.8 active primary care physicians per 100,000 population ratio, 4946 new primary care physicians were needed per year; since primary care averaged 6128 new certifications per year, a downsizing of 1182, or 20%, was indicated. Only family practice, neurosurgery, otolaryngology, and urology did not require downsizing. Seventeen medical and hospital-based specialties, including 7 of 10 internal medicine subspecialties, needed downsizing by at least 40%. Less downsizing in general was needed in the surgical specialties and in psychiatry. A managed care dominated-system would call for greater downsizing in most of the non-primary care specialties.

**Conclusion.** These data support the need for downsizing the nation's physician supply, especially in the internal medicine subspecialties and hospital support specialties and to a lesser extent among surgeons and primary care physicians.

Between 1950 and 1980, the growth of the nation's physician workforce outpaced the growth of the general population. The physician-to-population ratio for patient-care physicians increased nearly 34%, from about 112 per 100,000 in 1950 to 150 per 100,000 in 1980.<sup>1</sup> By 1980, researchers were forecasting an impending physician glut.<sup>2-8</sup> Yet the supply of physicians continued to expand, reaching a ratio of 182 per 100,000 population by 1990, representing a 63% increase over the 1950 figure. Growth in physician supply is expected to continue outpacing population growth well into the next century.<sup>4</sup> During the 1980s, physician workforce monitoring suffered from "benign neglect."<sup>9</sup> The health care reform debates in the early 1990s, stimulated by rising costs, limitations on access, and the growth of managed care, rekindled interest in the size and composition of the physician workforce.

Most researchers and policy makers agree that physician oversupply contributes to rising costs and that the preponderance of specialists exacerbates this problem, contributing little to improving quality or access.<sup>10-15</sup> Between 1965 and 1992, the primary care physician-to-population ratio (including practitioners in general/family practice, general internal medicine, and general pediatrics) increased only 13%, from 59 per 100,000 to 67 per 100,000, compared with the specialist-to-population ratio, which increased by 121%, from 56 per 100,000 to 123 per 100,000.<sup>1</sup> Between 1980 and 1990, the number of specialty board-issued certificates grew by 118% in radiology, 85% in gastroenterology, 63% in anesthesiology, and 61% in cardiology.<sup>16</sup> Although the percentages vary by specialty, a significant percentage of physicians who declare themselves as specialists are not certified in that specialty. Therefore, the number of physicians practicing in a given specialty is greater than the number of physicians certified in that specialty.

Managed care arrangements, particularly staff- and group-model health maintenance organizations (HMOs), typically use various provider services—including those of physicians generally and specialists in particular—differently from fee-for-service delivery systems. HMOs generally use fewer physicians and a higher proportion of primary care physicians.<sup>17</sup> As Americans continue to enroll in managed health care arrangements, it appears that the future size and composition of the physician workforce will not be well matched with requirements for services.<sup>18-21</sup> In response to this pending mismatch, national commissions, councils, and analysts have recommended changes in graduate medical education to alter the size and composition of the physician workforce; these have included the Institute of Medicine<sup>20</sup> and the Pew Health Professions Commission.<sup>21</sup> Of particular interest is a recommendation by the Council on Graduate Medical Education (COGME), an advisory body to the Secretary of the Department of Health and Human Services and the U.S. Congress. COGME recommended that the nation limit the number of first-year residency training positions to 110% of the graduates of U.S.

medical schools instead of the current 140%.<sup>22,1</sup> Applying this recommendation would have meant the loss of approximately 5000 first-year residents, a roughly 20% decrease.<sup>23,1</sup> According to the Council's analysis, this reduction would fall heavily on medical, surgical, and hospital-based specialties and subspecialties.

Between 1993 and 1995 the number of new specialists being trained decreased somewhat.<sup>24</sup> However, the supply of physicians is less responsive to market demands than the supply of other professionals because of the length of undergraduate and graduate medical training. The training environment reacts primarily to hospital-based market incentives rather than national workforce needs, favoring specialists at the expense of primary care practitioners.<sup>25</sup>

Concerned about a future supply and demand mismatch and the social cost of misdirected careers, the Health Resources and Services Administration's Bureau of Health Professions and the Pew Health Professions Commission sponsored a medical specialty workforce conference in March 1995. Representatives of medical specialty associations, leaders of academic medicine, researchers, and policy makers convened to discuss specialty workforce forecasting in a changing health care environment.<sup>26</sup> The conferees concluded that few specialty societies have initiated rigorous studies of future workforce requirements.<sup>27,28</sup>

Following the conference, the Bureau of Health Professions undertook a study to project the specialty-specific downsizing necessary in a system increasingly dominated by managed care. The results of that study are reported here. Previous research had focused on primary care physicians and specialists in the aggregate instead of estimating workforce needs by specialty.<sup>1,17,23,25</sup>

Our projections constitute a package of forecasting tools that specialty societies and others can use in comparing current rates at which new physicians are being produced against estimates of future demand. Our purpose was to provide estimates developed by a consistent method across specialties to serve as a starting point for a discussion of physician downsizing. We hope that we will stimulate other researchers with access to more precise information about the characteristics of specialty practice to engage in additional forecasting.

## Methods

**Maintaining the status quo.** Beginning with the conservative assumption of maintaining the existing physician-to-population ratio, we compared the number of new physicians being certified with the number needed to sustain the status quo. In this maintenance scenario, we assumed that there would no longer be a need for the growth in physician supply to outpace population growth and that at most the former should keep pace with the latter. Our assumption was that overall the physician workforce was growing too rapidly and that continued increases for any of the specialties was not warranted.

To determine the annual growth in the supply of physicians, by specialty, that would be necessary to maintain

existing physician:population ratios, we first added (a) losses from death and retirement and (b) the increase necessary to parallel population growth. Then by comparing the number of new physicians entering each specialty against the number needed to maintain the status quo, we calculated an initial estimate of the downsizing necessary for each specialty. We then summed these specialty-specific estimates to produce an overall total, a primary care subtotal, and a specialist subtotal of the estimate of downsizing needed.

To derive physician-to-population ratios, we used data from several sources. The 1995/1996 volume in the American Medical Association's (AMA) *Physician Characteristics and Distribution* series provided the total number of active allopathic (MD) physicians by self-designated specialty for year end 1993.<sup>29</sup> The American Osteopathic Association provided estimates of osteopathic physicians by specialty for 1993.<sup>30</sup>

To estimate the number of new physicians entering the marketplace yearly, we averaged the number of new board certificates issued each year from 1990 through 1994, using data from the American Board of Medical Specialties *Annual Report and Reference Handbook*.<sup>31</sup> Although we included those osteopathic physicians who were certified in allopathic specialties, we did not include osteopathic physicians certified in osteopathic specialties. This exclusion makes estimates of the numbers of physicians added yearly more conservative. Our intention was to estimate the minimum level of downsizing needed. For each year from 1990 through 1994, we estimated the number of new general internal medicine certificates by subtracting an estimate of the physicians who obtained general internal medicine certificates but continued training to obtain subspecialty certification, using data from an earlier study.<sup>32</sup> For the subspecialties of internal medicine in which certificates are awarded every other year, we computed a yearly average for the six-year period 1989–1994 by dividing the three biennial figures by six. To obtain the number of new general pediatric certificates, we subtracted the number of pediatric subspecialty certificates from the overall number of pediatric certificates issued in a given year.

We used an estimate of 2% for the separation rate (yearly losses due to death or retirement). Although this rate would vary by specialty because of differences in age, gender, and other factors,<sup>9</sup> the overall loss to supply is about 2% annually.<sup>4</sup> Specialty-specific separation rates were not available to us; we recommend that specialty societies adjust our estimates based on more precise rates.

The annual rate of increase in population between 1993 and 2020 was calculated from Census Bureau forecasts of the future size of the nation's population.<sup>33</sup> This rate was applied to specialty supply figures to determine the increase needed to keep pace with population growth.

**Downsizing requirements for a managed care-dominated future.** Because we challenged the assumption that maintaining the per-population ratios of primary care physicians and specialists would be appropriate in a managed care-

dominated system, we refined our downsizing estimates by deriving specialty-specific workforce requirements from four sources and averaging them.

There are two generally used methods of estimating requirements by specialty—needs-based and demand-based models. We averaged the estimates derived from one needs-based model and three demand-based models. Historically, most demand models have forecast future supply needs assuming the continuation of a fee-for-service-dominated system. Since we assumed evolution to a system dominated by managed care, our demand-based estimates were extrapolated from the staffing patterns of existing managed care organizations.

**Needs-based model.** In 1980, the Graduate Medical Education National Advisory Council (GMENAC) developed a set of needs-based estimates of the number of physicians by specialty needed for the projected 1990 U.S. population.<sup>34,35</sup> A needs-based model projects workforce requirements based on existing estimates of morbidity and use of necessary health maintenance and prevention services. The GMENAC model started with data on the prevalence of disease, the estimated percentages of people with specific diseases who would require care for those conditions, and the number of visits estimated to be required per episode of illness per year. It summed all morbidities for the entire U.S. population, estimated the percentage requiring treatment from each specialty, and estimated the percentage of each specialty's visits that "should," according to GEMANAC, be delegated to non-physician providers. Then the total national requirement for physicians was determined by dividing the visits needed by the number of visits estimated to be provided by physicians in each specialty.

GMENAC developed an original set of estimates that were then adjusted by panels of experts to reflect best practice standards, anticipated increases in morbidity by 1990, and the potential for delegation to other health care providers. Although predating much of the growth in managed care, these estimates assumed no barriers to access<sup>36</sup> and thus are estimates for an efficient health care delivery system.

These 20-year-old estimates have shortcomings but are the only specialty-specific requirements that model what might be called an efficient system. Other needs-based estimates have not accounted for changes in morbidity such as the unanticipated epidemic of HIV infection.

**Demand-based models.** Demand-based models, on the other hand, forecast future requirements assuming the continuation of existing patterns of care delivery and staffing. To evaluate a system dominated by managed care, we chose three managed care models from which we extrapolated staffing needs to combine with the estimates from the adjusted needs-based model. First, we used data from a composite of seven Kaiser Permanente plans,<sup>12</sup> although these data are several years old, they have been cited in the literature as representative of staffing in such plans. Second, we used 1992 data from Kaiser Permanente-Portland,<sup>12</sup> which was considered to be an accurate reflection of then-

**Table 1. Percent downsizing necessary to maintain 1993 physician-to-population ratios, by specialty**

Physician specialty	1993 ratio per 100,000 population	Supply increases needed		Total increases	Average certificates per year 1990-1994	Average certificates per year minus total increases	Percentage downsizing necessary <sup>a</sup>	Downsizing category <sup>b</sup>
		To replace losses	To keep up with population growth					
Primary care . . . . .	67.4	3495	1451	4946	6128	1182	19.3	Small
Family practice . . . . .	29.7	1537	638	2175	2347	172	7.3	No change
Internal medicine . . . . .	24.7	1278	531	1809	2264	455	20.1	Moderate
Pediatrics . . . . .	13.1	680	282	962	1517	555	36.6	Moderate
Specialists . . . . .	132.2	6853	2845	9698	14,527	4829	33.2	Moderate
Medical . . . . .	26.4	1368	568	1936	3787	1851	48.9	Large
Allergy . . . . .	1.3	67	28	95	124	29	23.1	Moderate
Cardiology . . . . .	6.3	326	135	461	690	229	33.2	Moderate
Dermatology . . . . .	2.8	147	61	209	285	80	27.8	Moderate
Endocrinology . . . . .	1.1	60	25	84	135	51	37.5	Moderate
Gastroenterology . . . . .	3.2	164	68	232	441	209	47.5	Large
Medical oncology . . . . .	1.8	95	39	134	285	151	52.8	Large
Hematology . . . . .	1.0	54	23	77	146	69	47.4	Large
Infectious disease . . . . .	1.3	67	28	94	221	127	57.3	Large
Nephrology . . . . .	1.5	79	33	112	194	82	42.4	Large
Pulmonary disease . . . . .	2.4	124	51	175	375	200	53.4	Large
Rheumatology . . . . .	1.2	61	25	86	149	63	42.3	Large
Pediatric subspecialties . . . . .	2.4	125	52	177	738	561	76.0	Large
Surgical . . . . .	47.0	2436	1011	3448	4237	789	18.6	Small
Colon and rectal . . . . .	0.4	19	8	26	48	22	44.9	Large
Obstetrics/gynecology . . . . .	12.3	639	265	904	1096	192	17.5	Small
General . . . . .	10.9	567	235	802	997	195	19.5	Small
Neurosurgery . . . . .	1.5	79	33	111	113	2	1.6	No change
Ophthalmology . . . . .	6.0	309	128	437	537	100	18.6	Small
Orthopedics . . . . .	7.1	369	153	523	636	113	17.8	Small
Otolaryngology . . . . .	2.9	152	63	215	237	22	9.3	No change
Plastic surgery . . . . .	1.8	94	39	133	199	66	33.2	Moderate
Thoracic surgery . . . . .	0.8	39	16	56	137	81	59.3	Large
Urology . . . . .	3.3	170	71	241	237	(4) <sup>c</sup>	(1.3) <sup>c</sup>	No change
Hospital-based . . . . .	24.7	1282	532	1814	2877	1063	36.9	Moderate
Radiology . . . . .	8.7	450	187	637	901	264	29.3	Moderate
Anesthesiology . . . . .	10.4	537	223	760	1485	725	48.8	Large
Pathology . . . . .	5.7	294	122	417	491	74	15.1	Small
Other . . . . .	34.1	1767	733	2500	3626	1126	31.0	Moderate
Psychiatry . . . . .	12.2	631	262	893	1023	130	12.7	Small
Child psychiatry . . . . .	1.7	90	37	128	273	145	53.3	Large
Emergency medicine . . . . .	6.4	332	138	470	1007	537	53.3	Large
Neurology . . . . .	3.6	185	77	262	401	139	34.6	Moderate
General preventive medicine . . . . .	2.3	119	50	169	270	101	37.4	Moderate
Medical genetics . . . . .	0	1	1	2	106	104	98.2	Large
Nuclear medicine . . . . .	0.5	24	10	34	86	52	60.8	Large
Physical medicine . . . . .	1.6	85	35	120	295	175	59.2	Large
Radiation oncology . . . . .	1.1	59	24	83	165	2	49.5	Large
Other specialty <sup>d</sup> . . . . .	4.6	239	99	339	...	(339) <sup>c</sup>	...	No change
<b>Total . . . . .</b>	<b>199.6</b>	<b>10,348</b>	<b>4296</b>	<b>14,644</b>	<b>20,655</b>	<b>6011</b>	<b>29.1</b>	<b>Moderate</b>

<sup>a</sup>Percent downsizing necessary is the percent decrease in new physicians being certified that would be necessary to maintain supply growth at the rate of population growth.

<sup>b</sup>Downsizing categories are based on percent downsizing necessary; small = 10.1% to 20%; moderate = 20.1% to 40%; large = 40.1% to 100%.

<sup>c</sup>Increase needed instead of downsizing.

<sup>d</sup>"Other specialty" includes other internal medicine subspecialties such as hepatology, diabetes, and nutrition, and "other and unspecified" specialties. The average number of certificates issued in these specialties could not be estimated because data were not available.

SOURCES FOR DATA: References 29, 30, 31, 33.

current HMO staffing needs without adjustments for services used by plan members that were not delivered by plan doctors or for enrollment of nontraditional populations such as the elderly and the poor. Third, we used data from a 1992 study of two large, mature plans,<sup>37</sup> one in Seattle and the other in Minneapolis, thought to be indicative of the staffing patterns needed by HMOs that have matured in age. Demand-based estimates such as these carry the biases inherent in the present system in these local markets into the future. Staffing patterns may be influenced by the degree of penetration of managed care in the local markets and may change with the growth of managed care.

**Composite estimates.** We estimated staffing needs for 28 medical specialties by, first, averaging the estimates derived from the four models (GMENAC and three managed care models). We then compared these estimates to 1993 supply ratios. (See Table 2.) Specialty-specific estimates of staffing needs derived from 1983 data for the seven Kaiser Plans, the Kaiser-Portland 1992 data, and data for the mature HMOs were adjusted upward by 7% before averaging with GMENAC estimates. This adjustment, derived from the patient care/non-patient care ratio found in the AMA data,<sup>29</sup> was necessary to arrive at an estimate of active supply because it allowed us to account for the appreciable absence from HMO staffing estimates of non-patient care physicians such as teachers, researchers, and administrators. (Non-patient care physicians were already included in the GMENAC estimates.)

We then created a confidence interval by simply calculating an estimate of the standard deviation (SD) for each distribution at the range divided by four.<sup>29</sup> We assumed that any specialty ratio above the mean plus one SD was in need of further downsizing. Using the mean plus one SD in a sense provides a cushion that allows for several factors that might alter the composite estimate, such as the increased enrollment of nontraditional HMO populations who are likely to require more services than traditional enrollees.

## Results

To maintain the 1993 supply of 199.6 active allopathic-osteopathic physicians per 100,000 population, the nation needed to produce 10,348 physicians each year to replace losses and an additional 4296 to keep pace with population growth, for a total of 14,644 new physicians yearly (Table 1). Note that 70% of the new production would be for replacement, not growth. We found that an average of 20,655 physicians were certified per year between 1990 and 1994. Assuming that certificates are a conservative estimate of additions to the physician workforce, the workforce needed to be downsized by at least 6011 physicians annually to maintain the 1993 supply ratio. On the graduate medical education level, this means that the 24,000-plus new entrants annually should have been reduced to approximately 18,000 to 19,000. This finding is consistent with a 20% reduction suggested in an earlier study<sup>23</sup> and in the COGME recommendations.<sup>1</sup>

The issue is how reductions should be allocated by specialty. Assuming 2% replacements annually due to death and retirement and accepting the Census Bureau's 27-year forecasted population growth (1993 to 2020) in the Bureau's mid-series estimates,<sup>33</sup> the system needed to produce 9698 specialists per year to maintain the 1993 physician-to-population rate for non-primary care physicians of 132.2 per 100,000. Of the 9698, 6853 would be needed to replace exiting workers, and 2845 to cover population growth. The 1990-1994 average rate of 14,527 certified specialists annually suggests the need to downsize by 4829, or about 33%, in non-primary care specialties (Table 1).

To maintain the 66.8 primary care physicians per 100,000 population ratio, primary care physicians would have needed 3495 replacements per year plus 1451 to cover population growth, for a total of 4946. Since primary care physicians averaged 6128 new certifications yearly from 1990 through 1994, downsizing by 1182, or about 19%, was indicated to maintain the 1993 ratio. In other words, 80% (4829/6011) of the downsizing needed was in the non-primary care specialties and 20% (1182/6011) was in the primary care specialties.

Table 1 shows the percentage downsizing needed for each specialty given the maintenance scenario.

Only family practice, neurosurgery, otolaryngology, and urology did not require downsizing. In contrast, 17 specialties needed downsizing by at least 40%, including 7 of the 10 internal medicine subspecialties. The need for downsizing in the surgical specialties was small, but there was variation. All of the other specialties required moderate or large downsizing, except psychiatry.

These results are for downsizing the physician workforce to maintain the existing physician-to-population ratio. In other words, these estimates assume that current workforce supply and requirements are in balance. If there was already a surplus of specialists in 1993, as some maintain,<sup>1,12,20</sup> then even further downsizing would have been required. To test this assumption, we averaged four different estimates of specialty staffing needs and compared these estimates with the existing supply (Table 2). The mean of these four models showed a requirement for total active physicians of 161.4 per 100,000 population, with an upper confidence bound of 178. Since the 1993 supply of 199.6 per 100,000 population was well above this projected upper bound for a managed care-dominated system, there was indeed a surplus of physicians that called for further reductions.

The requirement for active primary care physicians using this approach was 66.5 per 1000, with an upper bound of 73 (Table 2). The primary care physician supply ratio of 67.4 per 1000 was below the upper bound and therefore indicated no additional downsizing. However, the specialist requirement of 94.9 per 1000 with an upper bound of 107 was well below the 1993 specialist ratio of 132.2 per 100,000. These estimates suggest that a managed care-dominated system would require even greater downsizing of the specialties than would be required to maintain the 1993

**Table 2. Estimated staffing requirements per 100,000 population for a projected managed care-dominated future, by specialty, averaging one need-based and three demand-based (HMO) staffing models, compared with 1993 physician supply by specialty**

Physician specialty	GMENAC	Seven Kaiser plans	Kaiser-Portland	Two mature HMOs	Average requirement	Estimated standard deviation	Upper bound	1993 ratio	Further downsizing needed <sup>b</sup>
Primary care.....	64.7	57.4	60.2	83.7	66.5	6.6	73.1	67.4	No
Family practice.....	24.5	11.0	16.7	45.6	24.5	8.7	33.1	29.8	No
General internal medicine....	28.1	30.3	28.1	21.4	27.0	2.2	29.2	24.7	No
Pediatrics.....	12.1	16.0	11.9	16.6	14.2	1.2	15.3	13.1	No
Specialists.....	117.1	67.2	86.2	108.9	94.9	12.5	107.3	132.2	Yes
Medical.....	17.8	12.6	15.8	21.5	16.9	2.2	19.2	24.0	Yes
Allergy.....	0.8	1.2	1.7	1.5	1.3	0.2	1.5	1.3	No
Cardiology.....	3.1	1.8	3.0	5.4	3.3	0.9	4.2	6.3	Yes
Dermatology.....	2.8	2.4	2.5	2.8	2.6	0.1	2.7	2.8	Yes
Endocrinology.....	0.8	1.1	0.9	1.1	1.0	0.1	1.1	1.1	No
Gastroenterology.....	2.6	1.7	1.7	3.1	2.3	0.4	2.6	3.2	Yes
Hematology, oncology.....	3.6	1.8	2.3	2.5	2.6	0.5	3.0	2.9	No
Infectious disease.....	0.9	0.7	1.2	0.7	0.9	0.1	1.0	1.3	Yes
Nephrology.....	1.1	0.7	0.8	1.4	1.0	0.2	1.2	1.5	Yes
Pulmonary disease.....	1.4	1.0	1.4	2.0	1.5	0.3	1.7	2.4	Yes
Rheumatology.....	0.7	0.7	0.4	1.1	0.7	0.2	0.9	1.2	Yes
Surgical.....	38.9	29.8	35.3	41.9	36.5	3.0	39.5	46.6	Yes
Obstetrics/gynecology.....	9.6	11.5	11.6	12.1	11.2	0.6	11.8	12.3	Yes
General.....	9.4	6.2	7.0	9.4	8.0	0.8	8.8	10.9	Yes
Neurosurgery.....	1.1	...	1.4	1.1	1.2	0.1	1.3	1.5	Yes
Ophthalmology.....	4.6	3.1	2.4	5.9	4.0	0.9	4.9	6.0	Yes
Orthopedics.....	6.0	4.2	5.9	6.8	5.7	0.6	6.4	7.1	Yes
Otolaryngology.....	3.2	2.4	3.4	3.2	3.1	0.3	3.3	2.9	No
Plastic surgery.....	1.1	...	0.3	...	0.7	0.2	0.9	1.8	Yes
Thoracic surgery.....	0.8	...	0.1	...	0.5	0.2	0.7	0.8	Yes
Urology.....	3.1	2.3	3.3	3.5	3.1	0.3	3.4	3.3	No
Hospital-based.....	23.0	10.4	17.7	25.2	19.1	3.7	22.8	24.7	Yes
Radiology.....	7.7	4.7	8.5	13.6	8.6	2.2	10.9	8.7	No
Anesthesiology.....	8.9	3.9	5.9	9.7	7.1	1.5	8.5	10.4	Yes
Pathology.....	6.4	1.8	3.3	1.9	3.4	1.2	4.5	5.7	Yes
Other.....	37.5	14.4	17.4	20.4	22.4	5.8	28.2	36.9	Yes
Psychiatry.....	15.4	4.1	5.2	7.7	8.1	2.8	10.9	12.2	Yes
Emergency medicine.....	5.4	5.3	6.7	5.5	5.7	0.4	6.1	6.4	Yes
Neurology.....	3.3	1.7	1.3	2.4	2.2	0.5	2.7	3.6	Yes
Other specialties <sup>a</sup> .....	13.3	3.4	4.3	4.8	6.5	2.1	8.6	14.7	Yes
<b>Total.....</b>	<b>181.8</b>	<b>124.6</b>	<b>146.4</b>	<b>192.6</b>	<b>161.4</b>	<b>17.0</b>	<b>178.4</b>	<b>199.6</b>	<b>Yes</b>

<sup>a</sup>“Other specialties” includes radiation oncology, colon and rectal surgery, pediatric subspecialties, internal medicine, subspecialties of diabetes, hepatology, and nutrition, child psychiatry, general preventive medicine, medical genetics, nuclear medicine, physical medicine and rehabilitation, and “other and unspecified” specialties, the remainder of the specialties not defined in the Weiner study.<sup>12</sup>

<sup>b</sup>Further downsizing necessary to meet estimated staffing needs for a managed-care dominated environment:

Yes = additional downsizing needed compared to recommendation in Table 1.

No = no further downsizing recommended.

SOURCES FOR DATA: References 2, 12, 29, 30, 37.

supply ratio. These results are consistent with the recommendations in other reports.<sup>1,12,21</sup>

Because of inherent limitations in forecasting future managed care requirements from current estimates, we used these results to modify the previous findings rather than employing them as definitive estimates. For instance, if the 1993 ratio per 100,000 for a specialty fell below the upper bound, we suggested no adjustments to the analysis in Table 1. For 19 of the 25 non-primary care specialties with supply above the range, the data suggest additional reductions over those in Table 1. (See Table 2.)

## Discussion

This analysis provides an initial look at how downsizing in graduate medical education might be shared across specialties. In the first step of the analysis, assuming that existing physician-per-population ratios would be maintained, we found that most specialties required a moderate to large degree of downsizing. In the second step, we modified the results to reflect a future system less dominated by specialists and less reliant on physicians generally. This scenario suggested the need for further downsizing in most of the non-primary care specialties.

There are some assumptions that could be modified in future uses of this method. Where specialty-specific death and retirement rates exist, they should be substituted. These refined rates would not produce major adjustments in results, however. A specialty workforce of 5000 would need 100 replacements at 2%, 75 at 1.5%, and 125 at 2.5%. The population estimates could also be altered, but results would change slightly unless extreme values were used by the analyst.

The five-year averages of numbers of certificates awarded should be a good measure of growth in a given specialty because they include newly trained physicians and those who certify in a specialty from another specialty. Certified physicians have achieved proficiency in a given area of medicine, which makes them more likely to practice in that area. For some specialties with relatively high rates of "self-designated," non-board-certified practitioners, our downsizing estimates will be conservative. In some cases, non-boarded, self-declared specialists augment the supply by 30% to 35%.<sup>29</sup> If these additions were incorporated, the need for downsizing would be even greater. Although we believe that total annual certificates is a conservative estimate of new additions, it does overcount by including physicians who change specialty. Also, by using an average, we were not able to analyze trends, which could be done in a more detailed analysis. We recommend that professional societies and associations, state planners, and other analysts with detailed practice data make these and other adjustments that might be specific to a particular specialty.

Using certificates awarded, we identified only 20,000 of the more than 24,000 graduates<sup>24</sup> who enter graduate medical education each year. We do know that about 2500 new entrants are international medical graduates here on

exchange visas, about two-thirds of whom, or approximately 1600, will return to their home countries.<sup>39</sup>

A careful analysis is also needed of the "other and unspecified" category (Table 1). This category is our composite of small specialties with relatively few certificates per specialty.

Our results are fairly consistent with those of other studies, but there are some differences. Consider the article by Miller and colleagues on the employment prospects of recent medical graduates.<sup>40</sup> The largest percentage without a job were pathologists, but only a small reduction in this specialty was required according to our analysis. Recent pathology graduates surveyed in the Miller study may have faced the effects of the hospital downsizing that has resulted from increased penetration of managed care. This impact is not reflected in our estimate of the need for pathologists, as shown in Table 1, but is reflected in our estimate in Table 2, which was far lower than the 1993 supply. Technical advances and changes in state laws regarding supervision in laboratories may also be playing a part. After pathologists, Miller et al. found the highest level of unemployment among plastic surgeons, anesthesiologists, and pulmonary disease specialists; our findings were consistent with theirs for these specialties. Miller et al. found the lowest unemployment levels in urology, psychiatry, and family medicine (consistent with our results) and emergency medicine (inconsistent with our results).

Other studies have also found a need to downsize anesthesiology, reflecting the growing use of nurse anesthetists,<sup>41</sup> and a need to downsize gastroenterology<sup>27</sup> and ophthalmology.<sup>42</sup> Studies of otolaryngologists<sup>43</sup> and plastic surgeons<sup>44</sup> made no recommendations. A 1994 study of radiologists indicated that demand for diagnostic radiology is unclear and that there might be a short-term surplus for radiation oncologists.<sup>45</sup> Our analysis called for moderate downsizing in radiology. The 1994 Sunshine et al. study of radiologists assumed increasing demand over the forecasting period due to introduction of new technology.<sup>45</sup> Such an assumption produced requirements that compared more favorably with supply than those resulting from our maintenance scenario.

The only radical difference between our estimates and those of other studies was in emergency medicine (EM). EM physicians' staffing patterns may differ from those of other specialists. EM physicians tend to work fewer hours per week than other specialists<sup>46</sup> and do not spend their entire working lives in emergency rooms because of high levels of "burnout." Therefore, more EM physicians than we estimated would be needed to fill vacancies in hospital emergency departments, which would sustain a demand for their services. High levels of use may be due to the system's disenfranchised using emergency departments as their usual source of care or to the epidemic of violence. EM physicians are often inappropriately used to deliver non-urgent care. With the growth of managed care, it is likely that this demand will increase. Until the health care delivery system

provides other venues for the disenfranchised, this inflated demand for EM physicians will continue. (Emergency medicine illustrates that more thorough analyses are needed for individual specialties.)

The ranges for active primary care physicians and specialists resulting from our requirements analysis, when we adjusted then down to be comparable to estimates from a COGME study<sup>1</sup> and our previous work,<sup>25</sup> produce estimates that are uniformly lower for both primary care physicians and specialists than in the two earlier studies. In the COGME study and our previous work, specific adjustments were made for future enrollment of nontraditional populations, which would increase the need for both primary care physicians and specialists. Although our projections were based in part on estimates from mature HMOs, these estimates were outweighed by the other three lower estimates. Adjusting our estimates to specifically account for enrollment of nontraditional populations would produce an increase in primary care physician requirements and some mitigation of the specialty downsizing. We have not modeled such a scenario but have used a conservative criterion of one standard deviation above the mean to account for possible underestimation of future requirements in using "raw" ratios from HMOs. Moreover, any decision to further modify any specialty ratio to address the issues of access, morbidity, and technology change and at the same time hold the total physician supply ratio constant would call for increases or modifications in downsizing in those specialties at the expense of the remaining specialties.

Historical estimates of generalist growth do not take into account the recent increase in interest in primary care on the part of U.S. medical school seniors. However, research is needed into whether increased interest on the part of first-year residents translates into a career commitment to primary care. There is evidence that primary care has made only modest net gains in recent years.<sup>1</sup>

It should be emphasized that determining the adequacy of a specialty supply to meet future requirements only begins with numerical comparisons. With regard to primary care, despite what appears to be an adequate supply, there is still concern about the distribution, diversity, and competence of those practitioners who care for most of the problems that most people face most of the time. In terms of the highly specialized categories, future advances in technology and changes in the scope of practice need to be considered.

This analysis also assumes that physician wages and productivity and the use of non-physician providers will maintain their current patterns. It is entirely possible with the advance of managed care that these factors will change. Reductions in wages and productivity as well as continued increases in the proportion of the nation's wealth allocated to health care would justify a continued supply growth and mitigate the need for downsizing of the magnitude we suggest. On the other hand, greater use of non-physician providers would *increase* the need for downsizing. Also, primary care physicians often deliver specialty care and vice

versa. It is difficult to estimate the crossover, but AMA studies indicate that these tradeoffs balance each other.<sup>47</sup>

Finally, some HMO estimates tend to undercount the actual use of hospital-based specialties.<sup>37</sup> We incorporated staffing estimates for the mature HMOs from the original Hart et al. study that fully accounted for these specialties, but these estimates were diluted in being averaged with other ratios. Despite the precision of the methods used by Hart et al., we chose to incorporate other HMO staffing estimates and make subsequent adjustments rather than rely on the results of one study. Also, we note that group and staff model HMOs are not growing as fast as other forms of managed care such as independent practice associations and network arrangements; these group and staff model HMO staffing patterns may not represent the entire managed care sector. However, accurate ratios for other managed care settings are yet to be developed.<sup>48</sup>

Our estimates have shown that the nation's physician supply needs downsizing, especially among the medical and hospital-based specialties. To do otherwise, the nation risks the continued escalation of health care costs and the misdirection of valuable human resources whose training to a significant extent is supported by public dollars.

A study of this type cannot be definitive or precise, but it can provide approximations of the minimum changes that may be needed—a place to begin. Most important, it can also serve as a stimulus to policy makers, analysts, specialty societies, and other specialty organizations to objectively examine future workforce needs. Although taking collective action to reduce the size of a specialty is illegal, it is certainly appropriate for specialty societies and professional organizations to collect data on their respective practitioners, perform analyses, and evaluate the workforce implications of their findings because they will have significant effect on the quality, efficiency, and cost of health care.

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