HE 1996 REPORT of the Council on Graduate Medical Education identified an oversupply of physicians in the United States.1 Specialists, both surgical and medical, were said to make up the overwhelming majority of the reported excess. Recent legislative and marketplace changes have sought to address this issue. Responding to these forces, the public universities of California, unique in their predominately managed care contract base, have altered the training of their physicians, favoring a shift toward education in primary care. This study addresses the efficacy of the legislative, institutional, and market pressures in increasing the numbers of graduating medical students in California who pursue primary care residencies and the effect, if any, on general surgery as a career choice.

Surveys were received from 7 (88%) of 8 allopathic medical schools in California representing 5154 students (3645 from University of California medical schools). In the study period, the number entering primary care residencies rose from 45.5% in 1993 to 54.3% in 1998. Despite this overall trend, statistically significant increases were seen only for pediatrics between 1993 and 1994 (8.69% vs 11.47%, respectively; P = .05) with corresponding decreases in emergency medicine between 1997 and 1998 (8.08% and 5.23%; respectively, P = .02), obstetrics and gynecology between 1997 and 1998 (7.73% and 4.64%; respectively, P = .01), anesthesiology between 1994 and 1995 (5.40% and 2.73%; respectively, P <.01), and obstetrics and gynecology between 1995 and 1996 (8.08% and 5.23%; respectively, P = .02).

**Hypothesis:** Despite successful efforts in California to increase the number of graduating medical students entering primary care residencies, general surgery remains a popular career choice.

**Design:** Retrospective survey of annual graduating medical student residency selections from allopathic medical schools in California between 1993 and 1998.

**Methods:** Each medical school in California was sent a survey of its graduates’ specialty choices from 1993 to 1998. Once quantified, comparisons using t tests, χ2 analyses, and analyses of variance were performed to assess differences in graduating medical student career choices.

**Results:** Surveys were received from 7 of 8 allopathic medical schools in California representing 5154 students (3645 from University of California medical schools). Between 1993 and 1998, those enrolled in medical school in California (both at the University of California and private universities) entered primary care residencies with greater frequency, increasing from 45.50% in 1993 to 54.34% in 1998 (both figures include the field of obstetrics and gynecology). The number entering general surgery did not change significantly (5.75% in 1993 and 4.88% in 1998) (Figure 1 and Figure 2).

**Conclusion:** Owing to institutional, legislative, and marketplace pressures, more graduates of California medical schools (both public and private institutions) are choosing to become primary care practitioners. A corresponding decrease in medical students entering general surgery has not resulted, which points to an optimistic future and continuing demand for surgeons.

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MATERIALS AND METHODS

Letters were sent to the deans of each allopathic medical school in California requesting their school’s National Residency Matching Program results for 1993 to 1998. Only data for general surgery, internal medicine, family practice, pediatrics, obstetrics and gynecology, orthopedic surgery, otolaryngology, anesthesiology, emergency medicine, and urology were considered. Matches into combined programs (eg, internal medicine/pediatrics) were considered separately. The data were tabulated and compared for statistically significant differences ($P<.05$) using $t$ tests, $\chi^2$ analyses, and analyses of variance.

and again between 1995 and 1996 (2.73% and 0.50%; respectively, $P<.01$). Analysis of variance yielded statistical significance only for the anesthesiology group ($P<.01$) (Table 1).

When only the data from students at University of California medical schools were analyzed, it was found that these students also entered primary care residencies with increasing frequencies. Percentages of students entering general surgery, despite small variations, remained essentially unchanged. These results are seen in Figure 4 and are summarized in Table 2. A statistically significant decrease was noted between 1995 and 1996 in anesthesiology (3.50% and 0.52%; respectively, $P<.01$) and obstetrics and gynecology (7.14% and 4.34%, respectively; $P=.05$). Statistically significant gains were seen in pediatrics only between 1997 and 1998 (11.04% and 14.06%, respectively; $P=.02$). As before, analysis of variance only showed statistical significance for the anesthesiology group ($P<.01$).

COMMENT

By 1958, US medical schools were supplying the public with more than 6800 new physicians annually, which was not considered enough to meet the expanding US population. Medicare and Medicaid direct and indirect medical education reimbursements greatly expanded funding for physician training, indirectly resulting in an annual increase of new physicians from 7400 in 1965 to 15 000 in 1980. Owing to the structure of these federal programs, a larger proportion of funding was available for specialized, hospital-based training than for trainees in ambulatory medicine. This was accomplished via direct and indirect medical education costs built in to reimbursement schedules for hospital care. In 1993, reimbursement totaled more than $6.4 billion, or approximately $70 000 for each resident. With these large sums at stake, hospitals trained more residents, particularly specialists, resulting in a 59% increase of residents, from approximately 62 000 in 1980 to more than 98 000 in 1997. In California, this increase was 42%. The result has been a perceived oversupply of specialist physicians and a drop in those entering primary care residencies until 1993.

A variety of institutional, legislative, and market-driven pressures have sought to increase the amount of generalist care while decreasing specialist care. They begin before students enter medical school and continue throughout their student careers. Most notably, these pressures may include preferential bias to medical school applicants who express interest in pursuing primary care careers. Further, increased time in ambulatory care settings during medical school, legislative attempts such as the University of California 1994 “Memorandum of Understanding” and 1997 Budget Reconciliation Agreement, and, ultimately, market hiring practices have been implemented to attract medical students into primary care careers.

The calls for increasing the number of generalist physicians gained national prominence in 1986 when the Council on Graduate Medical Education advocated taking steps to change the specialist to generalist ratio to 50:50. This prompted the California legislature and Governor Wilson to adopt the 1994 Memorandum of Understanding, through which the state government became committed to increasing the number of residency positions in primary care fields (including obstetrics and gynecology) in the University of California by 23% (445 positions per year) while reducing those in the specialties by 19% (452 positions per year). The goal was to change the ratio of 33 generalists per 100 physicians to 55 per 100 physicians without changing the total number of physicians trained at University of California hospitals. Complete implementation of the Memorandum of
Understanding was deferred until 2002, in large part because of “uncertainty about the directions of health professions practice in a rapidly changing system.”9 Because these regulations were binding only to University of California programs, a concern is that any decrease in specialty training at University of California medical centers would be compensated for by an increase in specialties trained at the 3 private medical schools in California or, more likely, by an increase in specialists trained in other states. The first point is corroborated by this study. Our data show that, in 1998, 58.5% of University of California graduates entered primary care residencies, compared with 45.8% of California private school graduates. Further jeopardizing the goals of the Memorandum of Understanding is the fact that 38% of California’s practicing physicians completed residencies in other states.10 With fewer specialists trained in California, more physicians trained in other states could practice here, reducing any societal benefit to training fewer specialists in the state. To combat this, further reductions in specialist training must be implemented as part of a larger, nationwide effort.

Paralleling the state measures, the federal 1997 Budget Reconciliation Agreement went further in attempting to correct historical pressures by expanding specialty residencies. First, it removed the incentive to increase the number of residency positions by capping direct and indirect medical education payments, basing the payment on the number of residents as of the end of 1996. It also reduced the indirect medical education cost by 25% in 5 years. Finally, to shift funding toward primary care training, this legislation shifted substantial funding from inpatient (and specialty-driven) services to training in nonhospital settings. General surgery programs, like other predominantly hospital-based specialties, lost the financial incentive to expand.

These legislative reforms were responses to trends already occurring in the managed care marketplace in the United States and California in particular. Managed care organizations, currently insuring 92.5% of those insured in California,11 have physician-patient ratios markedly below the physician supply.12 Current estimates place general surgeon demand in managed care at between 4.2 and 6.5 surgeons per 100 000 enrollees compared with 10.8 available per 100 000 patients.12 With increasing penetration into new health care markets, it is likely that more people will be enrolled in managed care and, hence, more physicians will be employed by managed care organizations. Projections are that as this happens, more physicians (and specialists, in particular) will have difficulty finding employment. Estimates are that by 2000 there will be a nationwide physician surplus of more than 165 000, two thirds of whom will be specialists.9 These estimates are not universally accepted,13 but are driving public policy

Table 1. Career Selection for Graduates of California Medical Schools

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>General surgery</td>
<td>53 (5.75)</td>
<td>53 (5.96)</td>
<td>46 (5.46)</td>
<td>59 (7.31)</td>
<td>52 (6.09)</td>
<td>41 (4.88)</td>
</tr>
<tr>
<td>Internal medicine</td>
<td>164 (17.81)</td>
<td>183 (20.58)</td>
<td>180 (21.38)</td>
<td>179 (22.18)</td>
<td>187 (21.90)</td>
<td>183 (21.76)</td>
</tr>
<tr>
<td>Family practice</td>
<td>107 (11.82)</td>
<td>116 (13.05)</td>
<td>119 (14.13)</td>
<td>121 (14.99)</td>
<td>149 (17.45)</td>
<td>137 (16.29)</td>
</tr>
<tr>
<td>Pediatrics</td>
<td>80 (8.89)</td>
<td>102 (11.47)</td>
<td>83 (9.86)</td>
<td>103 (12.76)</td>
<td>93 (10.89)</td>
<td>98 (11.65)</td>
</tr>
<tr>
<td>Emergency medicine</td>
<td>55 (5.97)</td>
<td>61 (6.86)</td>
<td>70 (8.31)</td>
<td>63 (7.80)</td>
<td>69 (8.08)</td>
<td>44 (5.23)</td>
</tr>
<tr>
<td>Obstetrics and gynecology</td>
<td>68 (7.38)</td>
<td>60 (6.75)</td>
<td>62 (7.36)</td>
<td>61 (7.56)</td>
<td>66 (7.73)</td>
<td>39 (4.64)</td>
</tr>
<tr>
<td>Anesthesia</td>
<td>63 (6.84)</td>
<td>48 (5.40)</td>
<td>23 (2.73)</td>
<td>4 (0.50)</td>
<td>13 (1.52)</td>
<td>19 (2.26)</td>
</tr>
<tr>
<td>Urology</td>
<td>17 (1.85)</td>
<td>17 (1.91)</td>
<td>13 (1.54)</td>
<td>14 (1.73)</td>
<td>15 (1.76)</td>
<td>7 (0.83)</td>
</tr>
<tr>
<td>Ears, nose, throat</td>
<td>11 (1.19)</td>
<td>12 (1.35)</td>
<td>18 (2.14)</td>
<td>12 (1.49)</td>
<td>16 (1.87)</td>
<td>14 (1.66)</td>
</tr>
<tr>
<td>Orthopedics</td>
<td>52 (5.65)</td>
<td>37 (4.16)</td>
<td>31 (3.68)</td>
<td>28 (3.47)</td>
<td>19 (2.22)</td>
<td>32 (3.80)</td>
</tr>
<tr>
<td>Total</td>
<td>921</td>
<td>889</td>
<td>842</td>
<td>807</td>
<td>854</td>
<td>841</td>
</tr>
</tbody>
</table>

*All data are presented as number (percentage).

Figure 3. General surgery vs primary care (University of California only).

Figure 4. General surgery vs subspecialties (University of California only).
at present and affecting medical student career choices. For example, marketplace problems and subsequent publicity have had a large effect on the number of students entering the field of anesthesiology. This drop is clearly demonstrated by our data; however, as we also show, the austere prognostications have not produced any statistically significant decrease in general surgery residents. In fact, the percentage in 1998 (4.88%) is within 1% of that in 1993 (5.75%).

Because current funding mechanisms have stabilized, any increase in the number of primary care residents must be met with a concomitant decrease in medical specialty fellowships. Between 1986 and 1993, the number of those entering primary care residencies dropped from 52% to 38%, with most doing residencies in pediatrics or internal medicine specialized further. It is estimated that as many as 60% of internal medicine graduates and 40% of pediatric residency graduates specialize further. Without a preferential decrease in medical subspecialty fellowships, any increase in the numbers of students entering primary care residencies will yield more medical subspecialists. This will compound the oversupply of these physicians and prevent any increase in the supply of generalist physicians.

If there were a large oversupply of specialists such as general surgeons, the marketplace would be able to hire fewer newly trained specialists. Paradoxically, in a recent national survey of physicians finishing residencies in 1996, those completing residency in internal medicine and pediatrics were unemployed at rates of 11.1% and 9.3%, respectively, whereas only 6.2% of general surgery graduates were unable to find employment at the time of the survey. This is consistent with the other surgical specialties, which ranged from an unemployment rate of 1.0% in orthopedics to 9.2% in plastic surgery. Graduating medical subspecialist unemployment rates ranged from 1.3% in pulmonary and critical care to 19% in hematology. The marketplace, perhaps our best indicator of the present need for physicians, is hiring new surgeons at rates better than and comparable to those in primary care and the medical subspecialties. Clearly, a nationwide demand for new general surgeons exists.

The University of California, which enrolls more than 2600 medical students and sponsors 150 training programs with more than 4400 residents, is the largest medical educator in the United States. In addition, 71% of University of California residency graduates remain in the state to practice medicine. As part of its mission, the University of California “is obligated to restructure its medical education programs so as better to serve the needs of the citizens of California” and “has a responsibility to do what it can to enhance its capacity to meet the state’s future physician supply requirement.” During the study period, the number of University of California medical graduates entering primary care has risen from 46.64% in 1993 to 54.16% in 1998 (both include obstetrics and gynecology). This represents successful implementation of policy by the University of California in that it has been able to persuade more of its graduates to enter primary care fields. Our data confirm that this has not decreased the percentage of students entering general surgery from University of California schools.

Given the uncertainty of future directions in health care financing and use, predicting future needs is difficult. California, unique in its position at the forefront of a maturing, managed health care marketplace, serves as a harbinger for the rest of the nation. The state, as this study shows, is successfully educating more physicians interested in pursuing primary care fields without a large decrease in those entering general surgery. We predict that this trend will continue in other states, but we do not expect any net change in the makeup of the physician workforce in California unless each state enacts similar policies on resident training.

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REFERENCES


**DISCUSSION**

Theodore R. Schrock, MD, San Francisco, Calif: The authors set out to examine the ability of legislative, institutional, and market forces to increase the numbers of graduating students entering primary care and to determine what effect, if any, those pressures might have on percentages of students choosing a residency in general surgery. The study succeeds admirably in answering both questions. In short, more California graduates are entering primary care but there has been little effect on graduates entering surgical residency.

In the 1960s and 1970s, the notion arose that specialization should give way to generalization to humanize medicine, as Edmund Pellegrino has stated recently. Pressure in this direction has intensified in the last decade for reasons discussed by the authors, including the 1996 Council on Graduate Medical Education report, attributing most of the oversupply of physicians in the United States to excessive numbers of specialists. Further, specialists were blamed for ill such as the rapidly rising costs of health care and geographic maldistribution of physicians.

In the October 1998 Report of the Pew Commission Federal Policy Task Force, it was noted that the number of generalist residency positions increased 25% from 32 000 in 1987 to almost 40 000 in 1997. But, during the same 10 years, the number of specialist residency positions increased from 49 000 to almost 61 000, a gain of 11 000 (22%); a similar increase, but hugely different absolute numbers. (Beyond the Balanced Budget Act of 1997: Strengthening Federal GME Policy. Report of the Pew Commission Federal Policy Task Force, October 1998.)

National efforts to promote primary care have been successful. In fairness, not all of this change is due to managed care or legislative intervention. Primary care, especially family practice, became more respectable through better definition of its bounds, establishment of departments in medical schools, and definition of a scientific foundation. Family medicine has become a specialty and an academic discipline. The American Board of Family Practice was established, and the American Academy of Family Physicians was founded. The Report of the Pew Commission observed that between 1992 and 1996 the percentage of graduates planning to practice as generalists more than doubled, from 14.6% to 31.9%. As the authors of this article report, the percentages were even higher in California, with an increase of graduates entering primary care residencies (including obstetrics and gynecology) from 45.30% in 1993 to 54.34% in 1998.

The legislative pressures applied to the University of California medical schools have been described. It is remarkable in a sense that there was no significant decline in graduating students entering surgery, although the number of general surgery residency slots available in California declined 16.2%, from 736 in 1994 to 617 in 1997. In the same interval, the number of primary care residency slots (including obstetrics and gynecology) increased 6.2%, from 3599 to 3821. (California Graduate Medical Education Programs 1996-1997 Update. Office of Statewide Health Planning and Development, November 1998.)

Why has there been no apparent reduction in the percentage of students opting for residency in general surgery? First, of course, general surgery residency may eventuate in some other surgical specialty. According to the American College of Surgeons’ Socio-Economic Fact Book for Surgery 1996-1997, the percentage of surgeons who are general surgeons declined from 34.6% in 1970 to 30.7% in 1980 to 26.2% in 1994, an overall decline of 24.2% from 1970 to 1994. (In these data, pediatric surgeons and vascular surgeons are counted as general surgeons.) There was concomitant growth in other surgical specialties.

At least 2 other important factors account for the steady flow of graduating students in surgery. First, surgery remains a great career, and its appeal has not diminished despite regulations imposed by people who have little understanding or concern for our patients and the care that we give to them. What attracted you and me to surgery as medical students has not changed, and today’s students still respond to it. Secondly, surgery has great role models. A surgeon who serves as a role model may be the student’s parent or other relative, neighbor, personal physician, family friend, or medical school faculty member. Regardless of the source, the role model is a powerful influence on career choice. It certainly was true in my case, and I wager it was true for many of you, too. A student sees a surgeon in action and says, “I want to be like that.” No legislative pressure, no institutional directive, and no marketplace force, individually or together, can defeat the combination of surgery as a discipline and an outstanding surgeon as a practitioner in influencing the career choice of a medical student. That, I think, is what the data show. General surgery and its derivative specialties continue to appeal to graduating students in California and elsewhere, ensuring a steady supply of the brightest and best who will become our colleagues and eventual successors.

Two questions for the authors: Were there significant differences in student career choices or the percentage of students entering general surgery residency among the 7 medical schools sampled? Second, you quoted a national survey indicating that 6.2% of general surgery graduates were unable to find jobs. This is a little difficult for me to understand since in our experience, recent surgery graduates who are not going on to other specialty fellowships have multiple offers from which to choose. Have you any data on California surgery residency graduates in this regard?

John Payne, MD, Honolulu, Hawaii: I noticed that you identified a rather precipitous drop in the number of students going into the field of anesthesia. I wonder if you have any idea as to why that happened; if it perhaps relates to an increase in the number of nurse anesthetists used in university hospitals, suggesting to students that career opportunities might be diminished.

James E. Goodnight, Jr, MD, Sacramento, Calif: By 1990 it had become apparent that the G MENAC Study was quite wrong.
The GMENAC Study indicated that there would be 10,000 too many general surgeons, and it was obvious by that time that we were training the right number of general surgeons for the populace. I believe it was the American College that commissioned the Abt study, which then carefully reviewed the general surgical manpower and indicated that this was indeed true in 1990. We were training the correct number of general surgeons for the populace, and, in fact, the Abt study predicted that by the year 2010 we would need an additional 6000 general surgeons in the workforce if one carefully considers the active working general surgeons, not including people in training and not including people who are retired. So I think the future looks good for training in general surgery. I might add that the figures published by Olga Jonasson indicate that for California there are 6.5 general surgeons per 100,000 people, which is the number being hired by health maintenance organizations (HMOs) according to the article. Interestingly enough, Kaiser in Sacramento has about 5.5 surgeons per 100,000. They make up the difference using surgical residents, which I think again influences what we do.

Would the authors comment on the perceived need for general surgeons? We are planning for an increased need for general surgeons in the populace.

Richard Mullins, MD, Portland, Ore: I would like to challenge the authors of this fine paper on their assumption that all of those residents who went into general surgery training programs went into general surgery. Do you have numbers on how many general surgery residents actually end up practicing in some surgical specialty? We should keep clear in our mind the difference because the health care policy question is how many general surgeons are we training in general surgery residency programs?

Dr Williams: Why has there been no reduction in the number of students in general surgery? I think Dr Schrock covered that well, and he asked if there were any significant differences among the medical schools in California in terms of career choice. No, it was the same throughout the University of California and the private medical schools. Between 5% and 6% of graduates selected general surgery as a career. The only difference that we did find was in the number who went into primary care from the private medical schools and the University of California.

Dr Schrock pointed out that most of us have the impression that our graduates find jobs very easily in general surgery or the other subspecialties. The unemployment figure of 6% for general surgery was a national figure, and I don’t know of any corresponding information in California.

Dr Payne asked what the reason was for the reduction in number of anesthesia students. I think that was very clearly the perception that there was unemployment among our graduating students in anesthesia. I don’t know anyone who is without a job. In anesthesia, many of them were not able to go to the locations and have the freedom that they were used to in selecting their career.

Dr Goodnight, I appreciate your comments on the perceived need for general surgeons and the information relating to the HMOs. That figure of between 4 and 6 general surgeons per 100,000 based on HMO experience may not be realistic for other institutions. HMOs contract out some of their tertiary and quaternary care. Many of them don’t operate trauma systems and, as a result, their patients are treated by other surgeons. If they were treated in the HMO, it is probable that they would require an increased number of general surgeons for those specialties. In HMOs, the patients generally are younger and healthier and take no account of the Medicaid population and the unfunded population. It is known that patients with Medicaid have a 20% higher need for health care than other groups of patients, so once again, it is likely that whoever is treating that group of patients will require higher numbers of surgeons. Also, many enrollees in HMO systems make about half of their treatment visits outside of the system for treatment.

Finally, Dr Mullins, regarding your question about how many general surgeons actually go into fields other than general surgery, we can’t answer that. But certainly in training programs we know that many of the enrollees leave after the fourth year and go into other subspecialties. I think that there is a frustration among many people who work with surgical trainees that there is a need to train pure general surgeons.