

Analysis of Factors Affecting U.S. Emergency Physician Workforce Projections

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■ ABSTRACT

Objectives: To use existing data sources to refine prior estimates of the U.S. emergency medicine (EM) workforce and to estimate effects of proposed changes in the U.S. health care system on the EM workforce.

Methods: Relevant data were extracted from the American College of Emergency Physicians (ACEP) 1995 Membership Activity Report, the American Medical Association (AMA) publication "1995/96 Physician Characteristics and Distribution in the U.S.," the American Hospital Association (AHA) 1994 hospital directory, a written survey of each state's medical licensing board and state medical society, and the American Board of Emergency Medicine (ABEM) annual activity report for 1995. These data were used to project workforce supply and demand estimates applicable to workforce models.

Results: None of the available information sources had complete data on the number and distribution of emergency physicians (EPs) currently practicing in the United States. Extrapolating the limited reliable statewide EP numbers to make nationwide projections reveals a shortage of EPs needed to fully staff the nation's existing EDs. At least 22 states had an average ratio of <5 EPs per existing ED. Additional national projections incorporating a decreasing number of U.S. EDs indicate that the current annual number of EM residency graduates will not eliminate the deficit of EPs for at least several decades, given that projected numbers of retiring EPs annually will soon equal the total annual EM residency graduate production.

Conclusions: Although the current data on EPs in practice in the United States are incomplete, the authors project a relative shortage of EPs. More accurate and complete information on the numbers and distribution of EPs in America is needed to improve workforce projections.

Key words: workforce; manpower; residency training; health care reform; emergency medicine.

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■ Workforce analysis and estimates of physician training needs by specialty have become increasingly important as the structure of the U.S. health care system changes in response to new economic forces. Two major studies on the general U.S. physician workforce have been re-

leased recently.^{1,2} Both of these studies predict a significant impending oversupply of U.S. physicians and make recommendations to limit the number of physicians in U.S. training programs. In both of these major studies, emergency medicine (EM) is not analyzed separately or in detail in respect to its workforce requirements.

Since EM is a new specialty (having been officially recognized by the American Board of Medical Specialties only since 1978), it does not have a well-established or stable pattern of physician workforce entry and retirement. The number of allopathic EM residency training programs has almost doubled since 1980 (from 60 to 114). The number of EM residency graduates annually also has increased from 150 to almost 800 over the same period. However, there is no long-

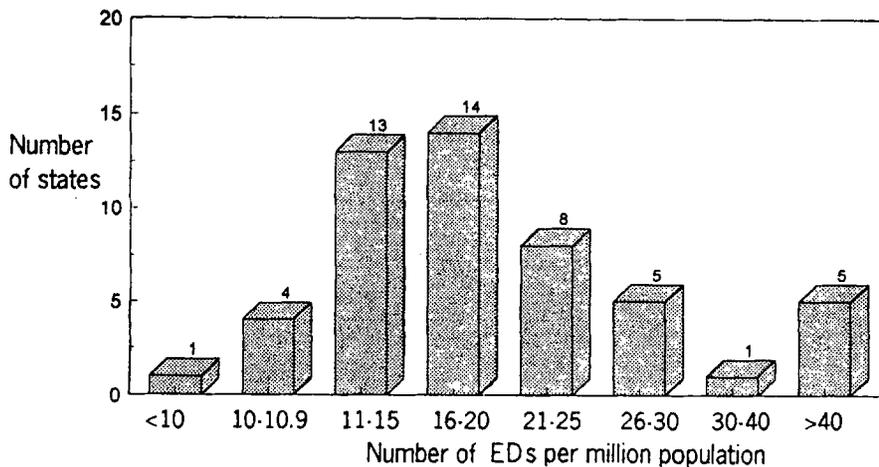
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■ FIGURE 1. Numbers of states with specific ED/million population ratios.

term information or experience regarding the longevity of these graduates in EM practice.

As a follow-up to a prior study³ and in response to the obvious need to generate reliable data on which to base workforce predictions, SAEM formed its Workforce Task Force in 1995. The objectives for this task force were to accumulate any relevant existing data on: the numbers of emergency physicians (EPs) currently in practice, the distribution of EPs from state to state, the numbers and types of other medical personnel practicing EM, and the numbers of physicians and positions in EM residency training programs. The task force was also directed to study and analyze trends in the U.S. health care system that would affect the EP workforce. This article summarizes the initial data accumulation and analysis efforts by the Workforce Task Force.

METHODS

Study Design: A review of existing workforce databases was performed and data were used to refine prior estimates of the U.S. EM workforce and to estimate effects of proposed changes in the U.S. health care system on the EM workforce.

Workforce Databases: To estimate the number and distribution of EPs practicing EM in the United States, the following sources were consulted:

1. The American Medical Association (AMA) publication "1995/96 Physician Characteristics and Distribution in the U.S."⁴
2. The American College of Emergency Physicians (ACEP) 1995 Membership Activity Report.⁵
3. A letter survey of each state's medical licensing board.
4. A letter survey of each state's medical society.

To determine the number of active EDs in America, the main source consulted was the American Hospital Association's (AHA's) 1994 hospital directory.⁶ This book represents a survey listing of the U.S. hospitals registered with the AHA and describes the facilities and services offered by each hospital.

To estimate the number of open EM positions at a single point in time, an analysis was made of positions offered in the September 1995 issue of the *Annals of Emergency Medicine*. The advertisements were individually reviewed. If the number of positions being offered was either multiple or unclear, a phone call was placed to the originator (hospital or search firm) of the advertisement, and the exact number of available positions was determined. We did not categorize the open positions by state.

Data Analysis: The number of EDs normalized per million state population was calculated for each state, based on the 1990 U.S. census numbers rounded upward to the nearest 1,000 persons. We estimated the total number of EPs in the state by dividing the number of ACEP members in each state by 0.638. This projected number of EPs was then divided by the number of EDs in each state, to yield a ratio of EPs per ED. The following scenarios also were assessed:

One scenario used the projected numbers of EDs per million state population. We chose to determine the effect on U.S. ED numbers given an arbitrary *ED per million state population ratio* of 10. This ratio was arbitrarily tested by the authors and is definitely not advocated as a policy.

Another scenario modeled was that the current median ratio of 18 EDs per million state population would be maintained. We assumed that the ratio would be applied only to those states that are above a ratio of 18 per million population already.

The numbers of EPs needed to staff the EDs for the above 2 different scenarios were calculated assuming the current estimated mean number of EPs per U.S. ED were sustained.

Our prior study³ demonstrated that the attrition rate for EPs leaving full-time EM practice each year was critical for making accurate workforce projections. We used the ABEM reapplication rate as a measure of attrition in EM (personal communication from Cole D, American Board of Emergency Medicine, April 1996). Because of the ABEM requirement to recertify in EM every 10 years, the number of reapplicants for the examination every 10 years can be compared with the same cohort taking the examination 10 years before.

RESULTS

The data obtained from the AMA publication and the surveys of the state medical licensing boards and state medical societies appeared incomplete for EPs. The AMA listed

17,744 EPs as of 1994. ACEP had 17,515 registered members as of December 1994. ACEP membership has previously been calculated to represent 63.7% of all practicing EPs.⁷ From the surveys of the state medical licensing boards and medical societies, it was determined that only 14 states maintained information on the numbers of EPs registered in their respective states. The numbers of EPs registered in these 14 states (Alabama, Idaho, Maine, Minnesota, Montana, Missouri, Nevada, New Hampshire, North Dakota, Ohio, Oklahoma, Oregon, Texas, and Wyoming) totaled 5,292. In these same 14 states, there were a total of 3,376 registered ACEP members. The ratio of ACEP membership to total EPs for these 14 states was 63.8% (3,376 divided by 5,292). Projection of this ratio for the entire country yields: 17,840 (the ACEP registered membership as of June 1995) divided by 0.638. Hence, our total projected number of practicing EPs in the United States is 27,692. This is close to prior estimates of 25,000 to 30,000 practicing EPs in America.^{8,9}

From the survey data, only 3 state medical societies provided data that allowed a calculation of the percentage of EPs in the state relative to the total number of physicians in that state. These 3 states were Idaho, Ohio, and Texas. The percentage of EPs relative to total physicians in these states ranged from 4.2% to 4.6%.

The AHA hospital directory listed 6,431 registered U.S. hospitals in 1994. Of these, 4,176 stated that they had an ED. However, there were 979 hospitals (15.2% of all the hospitals) that did not supply complete information to the AHA. Of the hospitals that did provide information to the AHA, the distribution of hospitals based on bed numbers was: 1,152 had <50 beds, 1,023 had 50 to 99 beds, 1,103 had 100 to 200 beds, and 1,489 had >200 beds. Thus, about half the hospitals with EDs each had <200 beds.

The number of EDs normalized per million state population varied from a low of 8.3 (Nevada) to a high of 73.6 (North Dakota). The 5 states identified with ED per million state population ratios ≤ 11 were California, Connecticut, New Jersey, New York, and Nevada. The 5 states identified with ED per million population ratios >40 were Montana, Nebraska, North Dakota, South Dakota, and Wyoming. Figure 1 shows the numbers of states with specific ED per million population ratios.

The median estimated statewide EP per ED ratio was 6.5, with a high of 17 (in Delaware) to a low of 0.7 (in South Dakota). Table 1 shows the 22 states who had calculated EP to ED ratios $<5:1$. This 5:1 ratio has been suggested as the minimum ratio allowing 24-hour single physician coverage.³

Using the scenario of an ED per million state population of 10 and a 1996 U.S. total population of 260 million, a total of 2,600 EDs would be needed for the entire United States. Given this scenario, at least 1,576 existing EDs would close. Twelve states in this scenario (Alaska, California, Connecticut, Delaware, Hawaii, Idaho, Maryland, New Jersey, New York, Nevada, Rhode Island, and Vermont) and Washington, DC, would have to close only ≤ 11 EDs to achieve this ratio. States that would have relatively larger numbers of hospital closings in this hypothetical scenario are shown in Table 2.

Using the scenario in which the current median ratio of 18 EDs per million state population would be maintained, a total of 3,681 U.S. EDs would remain, given that the formula would apply only to those states that are above a ratio of 18 per million population already. However, a total of 495 current EDs would close in this situation.

The numbers of EPs needed to staff the EDs in the above 2 scenarios were estimated using the current calculated mean number of EPs per ED ($n = 6.5$) in the United States. In the

■ **TABLE 1** States with Calculated Emergency Physician to ED Ratios $<5:1$ (the Minimum Ratio Projected as Necessary for 24-hour Physician Staffing)

Alabama	Nebraska
Arkansas	New Hampshire
Idaho	North Dakota
Iowa	Oklahoma
Kansas	South Dakota
Kentucky	Tennessee
Maine	Texas
Minnesota	Vermont
Mississippi	West Virginia
Missouri	Wisconsin
Montana	Wyoming

■ **TABLE 2** States with Relatively Larger Numbers of ED Closings in the Scenario of Limiting EDs to 10 per Million State Population

State	No. EDs Closed	No. EDs Remaining
Texas	194	175
Michigan	92	92
Missouri	90	52
Wisconsin	89	49
Pennsylvania	86	119

first scenario with an ED per million state population of 10, there would be 2,600 EDs and 16,900 EPs needed. In the second scenario with an ED per million state population of 18, there would be 3,681 EDs and 23,927 EPs needed.

The phone survey of advertisers in *Annals of Emergency Medicine* in September 1995 identified 1,348 full-time EP open positions. However, there were additionally 19 organizations, who, despite multiple phone calls, did not respond with their specific numbers of additional open positions. So the total number of open EP positions in September 1995 was probably at least 1,500.

We used the ABEM reapplication rate as a measure of attrition in EM. The ABEM 10-year recertification data for 5 cohort groups are shown in Table 3. The estimated annual minimal attrition for board-certified emergency physicians ranges from 0.7% to 3.2%.

■ **TABLE 3** ABEM Recertifying Data

No. Certifying (Year)	No. Recertifying (Year)	Recertification Ratio (%)	Annual Attrition (%)
(1981) 356	(1991) 326	91.6	0.9
(1982) 571	(1992) 389	68.1	3.2
(1983) 766	(1993) 604	78.9	2.2
(1984) 912	(1994) 781	85.6	1.6
(1985) 801	(1995) 749	93.5	0.7

DISCUSSION

The available data regarding the total number of EPs practicing in the United States at present are disappointing. The most reliable source of data at present may be the ACEP membership list, but of course ACEP membership does not represent all practicing EPs. Our calculated ratio of ACEP membership to total practicing EPs (63.8%) corresponds nicely with a prior estimate of 63.7% published 7 years ago.⁷ If this ratio is accurate, then it indicates that a total of 27,692 EPs may be currently in practice in the country. If it is assumed that the ratio of EPs to total physicians in the United States is 4.2% (as was reported by 3 states with such data), then the total number of EPs at present is 30,355 (4.2% of 722,748 U.S. physicians as of February 1996).¹⁰ Even using these projected numbers of EPs, Table 1 demonstrates that almost half the states are undersupplied with EPs for adequate 24-hour physician staffing of their existing EDs. The shortage of EPs is likely much worse than indicated by this table because of the 15.2% non-response rate of hospitals to the AHA registry from which the number of EDs in each state was calculated.

The ED per million state population ratio calculations show that the predominantly rural states tend to have a relatively large number of EDs per unit population. This trend is the result of the larger geographic areas that must be served by each ED as a result of a lower population density in those states. Since emergency care is time-dependent, and population densities vary considerably from state

to state, it is probably not realistic to expect application of the same ED per million state population ratio to all states. As shown in Table 2, a number of states would be disproportionately affected by ED closings under application of an arbitrary ED per population ratio, and this would deprive large areas of the country from timely access to emergency care.

This current study does not answer the question of how many EPs are actually needed on average to staff each ED in the United States. The correct standard number of EPs needed for an ED is debatable. The current median number of EPs per U.S. ED is 6.5. However, this number incorporates data from the 22 states identified in Table 1 as having inadequate ratios of EPs to EDs. Staffing considerations must address patient volume needs and services other than direct patient care (e.g., teaching, research, and administration). Hence, the optimal number may well be an average of 8 to 9 EPs per ED.

The projected annual attrition rates based on ABEM applications as shown in Table 3 are probably gross underestimates of the true attrition of practicing EPs at present. Because EM is such a young specialty, the initial cohorts of physicians recertifying would not yet be expected to be at retirement age, and so currently would have a low annual attrition relative to the same cohorts evaluated another 10 years in the future. Assuming each physician has a 30-year career span (entering practice at about age 30 and retiring at age 60) and that the practice-track board-certified physicians have 7 years' practice experience prior to becoming board-certified, one can

project that the total number of retiring EPs will top 1,000 as early as the year 2010. Thus, after about the year 2010, for EP numbers to stay at least in balance, more than 1,000 EPs must graduate from residency programs each year just to balance the retirement of previously trained EPs.

Because of the current uncertainty regarding the true annual attrition rate of EPs, future workforce projections must take into account different possible attrition rates. We anticipate an attrition rate of 4% annually (representing a slight increase from the AMA's baseline estimate for most medical specialties of 3%). The current number of allopathic EM graduates per year is about 900 but will increase to 1,100 in the next 4 years, based on the recent expansion of the number of residency programs. However, some institutions and programs are under pressure to decrease their resident numbers based on general institution-wide cutbacks in resident numbers.^{11,12} Hence, the offsetting effect of some programs' decreasing their resident complement while a few new EM residencies are approved may result in the number of EM residency graduates' remaining steady near 1,000/year for the next decade.

The Institute of Medicine report² recommended that the number of U.S. medical school graduates remain steady at about 17,000 per year. If there are a similar number of residency positions in the future, 1,000 EM residency graduates will represent 5.9% of all residency graduates in America. This is close to the current estimate of EPs' comprising about 4% of the total physician workforce. Since, there is evidence that the current 4% represents a current under-supply and it is likely that the number of residency positions will remain somewhat greater than the number of U.S. medical school graduates, the percentage of residency positions in the United States devoted to EM may be near the desired level.

The EM job market survey conducted as part of this study revealed

that there were >1,300 open EM positions. This represents >30% more positions than the number of EM residents graduating annually, thus reinforcing that EM is a currently undersupplied specialty. In support of that conclusion is a recent study reporting that EM was the second *lowest* specialty (0.6%) in terms of graduating physicians not finding appropriate employment.¹³

LIMITATIONS AND FUTURE QUESTIONS

The most prominent limitation to the present study is the incomplete data currently available on numbers and distribution of EPs and EDs in the United States. Another limitation is the lack of information about how many EPs are registered in more than one state, and how many are in part-time vs full-time practice. The lack of data on attrition and retirement rates and the "nonequilibrium" situation of the EP workforce at present also are limitations. However, the current study was designed to provide estimates of workforce supply and demand, which can be adjusted for uncertainty using mathematical models.³ Given the reasoning outlined in this article, we believe that there is consistency in our estimates and that with minor adjustment for data uncertainty, we can model the overall picture. Such modeling must of necessity encompass evolutionary changes in the workforce balance (e.g., the impact of managed care on the demand for EM services).

The SAEM Workforce Task Force is gathering new data on ED visit rates to further refine these issues.

The potential impact of an increased use of physician extenders on the needed EP workforce was not addressed in our study. This subject also is being investigated by the SAEM Task Force, but there appears to be little relevant data available at this time.

Clearly, more reliable and complete information on the number and distribution of EPs in practice, and on the attrition and retirement rates in EM, will enable more accurate workforce forecasting. A "point in time" survey of all EDs in the United States to determine current staffing would be useful for this purpose, despite the expense and difficulty of this survey.

CONCLUSIONS

The specialty of EM appears significantly undersupplied in order to adequately staff the nation's current number of EDs. Even if the number of EDs is significantly reduced by changes in the U.S. health care system, an increase over the current number of practicing EPs will likely be needed. Since the number of EPs required depends not only on the number of EDs but also on the number of emergency patients presenting for care, reduction in the number of EDs may not reduce the number of needed EPs. A reduction in the number of EM residency positions does not appear desirable in this decade.

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