

The Emergency Medicine Physician Workforce: Projections for 2030

Catherine A. Marco, MD*; D. Mark Courtney, MD, MSc; Louis J. Ling, MD; Edward Salsberg, MPA; Earl J. Reisdorff, MD; Fiona E. Gallahue, MD; Robert E. Suter, DO, MHA; Robert Muelleman, MD; Bradley Chappell, DO, MHA; Dian Dowling Evans, PhD, ENP-C; Nathan Vafaie, MD, MBA; Chelsea Richwine, PhD, MA

*Corresponding Author. E-mail: catherine.marco@wright.edu.

Study objective: The goals of this study were to determine the current and projected supply in 2030 of contributors to emergency care, including emergency residency-trained and board-certified physicians, other physicians, nurse practitioners, and physician assistants. In addition, this study was designed to determine the current and projected demand for residency-trained, board-certified emergency physicians.

Methods: To forecast future workforce supply and demand, sources of existing data were used, assumptions based on past and potential future trends were determined, and a sensitivity analysis was conducted to determine how the final forecast would be subject to variance in the baseline inputs and assumptions. Methods included: (1) estimates of the baseline workforce supply of physicians, nurse practitioners, and physician assistants; (2) estimates of future changes in the raw numbers of persons entering and leaving that workforce; (3) estimates of the productivity of the workforce; and (4) estimates of the demand for emergency care services. The methodology assumes supply equals demand in the base year and estimates the change between the base year and 2030; it then compares supply and demand in 2030 under different scenarios.

Results: The task force consensus was that the most likely future scenario is described by: 2% annual graduate medical education growth, 3% annual emergency physician attrition, 20% encounters seen by a nurse practitioner or physician assistant, and 11% increase in emergency department visits relative to 2018. This scenario would result in a surplus of 7,845 emergency physicians in 2030.

Conclusion: The specialty of emergency medicine is facing the likely oversupply of emergency physicians in 2030. The factors leading to this include the increasing supply of and changing demand for emergency physicians. An organized, collective approach to a balanced workforce by the specialty of emergency medicine is imperative. [Ann Emerg Med. 2021;■:1-12.]

Please see page XX for the Editor's Capsule Summary of this article.

0196-0644/\$-see front matter

Copyright © 2021 by the American College of Emergency Physicians. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).
<https://doi.org/10.1016/j.annemergmed.2021.05.029>

INTRODUCTION

Background

Since the inception of the practice of emergency medicine by a quartet of family physicians in 1961, the emergency physician workforce has undergone dramatic transformation.¹ Early in the history of the specialty, most physicians working in emergency departments (EDs) had not completed residency training in emergency medicine. The first emergency medicine residency training began in 1970. There are now 273 emergency medicine residencies accredited by the Accreditation Council for Graduate Medical Education (ACGME).²

Throughout its history, the specialty of emergency medicine has been committed to delivering easily

accessible, sophisticated, safe, and high-quality care to the public. In order to meet these public commitments, the specialty must produce a sufficient number of competent, trained, board-certified emergency physicians.

The American College of Emergency Physicians (ACEP) has periodically assessed the composition of the emergency medicine workforce.³⁻⁵ The most recent ACEP study surveyed hospitals using information from 2007. More recent emergency medicine workforce studies done by others have used varied methods and yielded disparate results.⁶⁻¹¹ To date, no study has adequately accounted for the numeric trends in residency graduate production, patient demands for emergency care, physician attrition,

Editor's Capsule Summary*What is already known on this topic*

The supply of emergency physicians and other emergency care clinicians is rising while the demand for emergency services changed.

What question this study addressed

What might the 2030 emergency care workforce look like?

What this study adds to our knowledge

Using existing data and a variety of assumptions and sensitivity analyses, a multiorganizational task force examined the future supply and demand for emergency care providers. By 2030, a potential oversupply of fully trained emergency physicians could exist.

How this is relevant to clinical practice

The final accuracy of these projections is unknown. Actions to address potential oversupply are difficult to calibrate given the limits of any predictive approach.

and the increasing integration of nurse practitioners and physician assistants in providing emergency care.

Importance

This study of the emergency medicine workforce projects whether the current trends will result in a deficit or surplus of residency-trained, board-certified emergency physicians. While a surplus would facilitate recruitment in rural and other underserved communities, it would have substantial marketplace consequences, such as decreased compensation and greater difficulty for physicians finding jobs. A persistent deficit would require a specialty-wide strategy to better address the public's need to access high-quality, safe emergency care.

Goals of This Investigation

The goals of this study include a determination of the current and projected supply of all contributors to emergency care, including emergency medicine-trained and certified physicians, other physicians, nurse practitioners, and physician assistants. This study will also determine the current and projected demand for residency-trained, board-certified emergency physicians.

MATERIALS AND METHODS

To forecast future workforce supply and demand, multiple sources of existing data were used, projections were made based on past and potential future trends, and a sensitivity analysis was conducted to determine how the final forecast would be subject to variance in the baseline inputs and assumptions. Methods included: (1) estimates of the baseline workforce supply of physicians, nurse practitioners, and physician assistants; (2) estimates of future changes in the raw numbers of persons entering and leaving that workforce; (3) estimates of the productivity of the workforce; and (4) estimates of the demand for emergency care services. Data from 2017 and 2018 were used as baseline information, and it was assumed that the workforce supply was equal to demand in the base years.

Study Design and Setting

This was a mathematical modeling study done by a task force convened by the ACEP comprised of representatives of the following organizations that accepted an invitation sent to all emergency medicine organizations (in alphabetical order): American Board of Emergency Medicine, American College of Emergency Physicians, American College of Osteopathic Emergency Physicians, American Osteopathic Board of Emergency Medicine, Council of Emergency Medicine Residency Directors, Emergency Medicine Residents' Association, and Society for Academic Emergency Medicine. The American Academy of Emergency Nurse Practitioners and Society of Emergency Physician Assistants participated as observers. A funded outside consultant (ES) and team from the Fitzhugh Mullan Institute for Health Workforce Equity at the George Washington University conducted the initial data acquisition and analysis. The task force and consultant team met in person and virtually several times in 2019 and 2020. A modified Delphi approach was used to achieve consensus about forecast models.

Interventions and Methods of Measurement

Baseline workforce supply of physicians, nurse practitioners, and physician assistants. Emergency medicine-trained physicians

The number of unique persons providing emergency care was estimated using Medicare claims data from 2012 to 2018 for all encounters coded using emergency medicine Current Procedural Terminology codes 99281 to 99285.¹² These data were crossmatched with the American Medical Association (AMA) Masterfile to identify physicians with emergency medicine training.¹³ This allowed for estimates of both emergency medicine-trained and nonemergency medicine-trained physicians billing Medicare for

emergency services in 2018 as well as trends over time. For 2018, there were 4,692 emergency physicians identified in the Medicare claims database who did not bill for at least 11 emergency medicine encounters in that year. There were also 2,664 physicians with emergency medicine training in the AMA Masterfile who did not bill Medicare. These may be persons working in the Veterans Health Administration, pediatric emergency medicine (not billing Medicare), or freestanding EDs or engaged in nonclinical work. As the purpose of this work is to forecast future demand and future supply of all emergency medicine specialty-trained physicians, these physicians were included in the modeling of the future supply.

Nonemergency medicine-trained physicians

The proportion of physicians without emergency medicine training who have been billing Medicare for emergency services has declined over time. The supply model continues to forecast a decline through 2030.

Numbers of nurse practitioners and physician assistants

Determining the numbers and functions of nurse practitioners and physician assistants working in emergency care is complicated. The recent growth of these providers choosing emergency care careers is nonlinear.¹⁴ In addition, individual providers may more dynamically enter and leave the emergency medicine workforce as they shift in specialty areas. Finally, nurse practitioners and physician assistants can bill under their own National Provider Identifier (NPI) number at a reduced rate compared to physicians, or they can augment the overall volume of work by evaluating, managing, and charting patients and then bill under the physician NPI number. This forecast model examined the numbers of nurse practitioners and physician assistants in 2018 who billed Medicare for at least 50 emergency services under their own NPI number to determine the proportion of total emergency medicine practitioners. In 2018, 15,198 of these providers (9,890 physician assistants and 5,308 nurse practitioners) billed Medicare for at least 50 emergency medicine services.

Future changes in numbers of providers entering and leaving the workforce. Emergency medicine-trained physician inflow

Residency-trained emergency physicians in allopathic and osteopathic residencies were quantified, and trends prior to 2020 were analyzed. To estimate future supply, the growth rate from 2008 to 2019 was calculated based on the observed number completing accredited emergency medicine training. The near-term supply was also

determined by estimating the number completing training in 2020 to 2023 based on the number of existing residents in ACGME- and AOA-accredited emergency medicine residency training. The projected annual growth in the number of residents in emergency medicine from 2023 to 2030 was projected under 3 scenarios: 0%, 2%, and 4% ACGME growth per year, respectively.

Emergency medicine-trained physician attrition

To estimate the degree to which physicians leave the emergency medicine workforce, we analyzed Medicare claims and identified individuals who were billing for emergency medicine services in one year but dropped out in subsequent years. This is an estimate of attrition, but it admittedly does not acknowledge some who may still be working in other areas of emergency medicine that do not bill Medicare, such as education, research, and administration. Based on past trends, we considered 3 scenarios: 2%, 3%, and 4% annual attrition rates through 2030.

Nonemergency medicine-trained physician attrition

From combined 2012 to 2018 Medicare Claims and the AMA Masterfile, we observed a 2.5% annual decline in nonemergency medicine specialty-trained physicians. Based on these trends, we project a continued annual decline of 2% per year from 2018 to 2030.

Nurse practitioners and physician assistants inflow

Medicare claims identified the number of nurse practitioners and physician assistants billing for emergency services from 2012 to 2018. Based on these data, we considered 3 scenarios—2%, 4%, and 8% net growth per year—to model the impact on total workforce supply.

Estimates of productivity of the workforce. Productivity of physicians

“Productivity” was defined as the total number of ED visits nationally seen by physicians divided by the estimated number of all emergency physicians and nonemergency physicians (the later physicians being limited to those seeing more than 50 patients in the ED during 2018). Medicare claims data and the AMA Masterfile estimated 2,342 emergency medicine visits per year/physician. Since the denominator for the visits per physician includes some emergency physicians who may not be seeing patients or who are working part time, the actual number of visits per full-time emergency physician is likely to be higher than 2,342. Though physician productivity could change, in the absence of evidence regarding in what direction the system

is moving, this study assumes the same productivity in 2030. Given the anticipated decrease in the number of nonemergency physicians, the model estimated that the share of physician ED visits provided by emergency medicine-trained physicians will go from 91% in 2018 to 94% in 2030, with the small remainder seen by nonemergency physicians.

Productivity of nurse practitioners and physician assistants billing for emergency services

The ability of the workforce to meet care demands of the future is affected by the productivity of other providers of emergency medicine services. Given the increasing supply and proportion of emergency medicine billing in recent years, it is likely that nurse practitioners and physician assistants will see a greater share of the total emergency patients in 2030. As a recent study by Bai et al¹⁴ found that 15% of visits in 2015 were seen by nurse practitioners and physician assistants alone, we projected this proportion to stay constant or increase to 20% for the final projections.

Estimates of demand for emergency services. ED utilization in 2030 is based on a population-based approach extrapolating visit rates by age group in the AHRQ Nationwide Emergency Department Sample 2017 (NEDS).¹⁵ This prediction acknowledges growth in the US population as well as proportionately higher use rates by older adults as a growing share of the US population.

$$\begin{aligned} \text{Projected ED use in 2030} &= \text{Baseline age} \\ &\quad - \text{specific ED use (2017)} \times \text{Age} \\ &\quad - \text{based population projections (2030)} \\ &\quad \text{from the US Census Bureau} \end{aligned}$$

ED use by age group was based on historical analysis of the AHRQ NEDS.

While we project ED utilization (total ED encounters) to increase due to growth of the US population (and, in particular, growth in those over 75 years of age), we believe there may be a year-to-year change in the proportion of the US population seeking emergency care. While the absolute number of ED encounters will grow, the amount of this growth relative to 2017 may vary. We modeled this with zero change in age-specific ED use rates (+13.4% total ED visits relative to 2018), 2% reduction in age-specific ED use rates (+11.2% total ED visits relative to 2018), and 5% reduction in age-specific ED use rates (+7.8% total ED visits relative to 2018). The model used +11.2% total ED visits relative to 2018 as the most likely scenario. This estimation is based on the emergence of forces driving reduced use, such as value-

based care and nonhospital-based emergency care. Revised population estimates in the future may also lead to slower growth in visits based on current population projections. Although the total number of visits per year in 2018 to 2030 would still rise, the increase would not be as steep.

Outcome measures

To understand whether the projected supply of emergency medicine-trained physicians in 2030 is likely to meet, exceed, or fall short of demand, the projected number of emergency medicine services was compared to the demand for emergency physicians. The demand for emergency physicians was estimated for 2030 by dividing the projected number of visits in 2030 by the estimated productivity parameter. Given that not all ED visits are seen by an emergency physician, the calculations account for the proportion of visits seen independently by nurse practitioners and physician assistants (hence 0.85 in the numerator) as well as the presence but declining number of other nonemergency physicians.

RESULTS

Estimate of the Workforce Supply of Physicians and Nurse Practitioners and Physician Assistants

Baseline. Number of individual emergency medicine-trained physicians

The distribution of the emergency medicine workforce billing Medicare for emergency medicine services in 2018 by provider type shows that emergency physicians comprise 70.3% of the practitioners, with physician assistants (14.7%), (nurse practitioners) 7.9%, and a small number of nonemergency physicians making up the balance (Table 1). The vast majority of emergency physicians are billing Medicare for at least 50 annual encounters (Table 1). Some emergency physicians are not billing Medicare at all or are billing fewer than 50 annual encounters. These physicians are still included in the final estimated supply in 2018, as some may be practicing pediatric emergency medicine, in the military, in the VA, in non-Medicare emergency or acute care, or working in research or leadership; though they are not seeing Medicare patients, they are essential to the specialty and are thus part of the overall supply of emergency medicine-trained individuals.

Number of nonemergency medicine-trained physicians

Claims data (2012 to 2018) show a decline of nonemergency physicians billing Medicare for emergency

Table 1. Baseline supply of emergency medicine practitioners in 2018.

Source of EM Supply	Number	Percent
Medicare Part B emergency medicine billers with emergency medicine specialty	39,904	59.3%
Medicare Part B billers with emergency medicine specialty but less than 11 emergency medicine bills	4,692	7.0%
Physicians with emergency medicine specialty in the AMA Masterfile but not found in Medicare Part B billing data	2,664	4.0%
Subtotal: All emergency physicians	(47,260)	(70.3%)
Internal medicine physicians	1,079	1.6%
Family medicine/general practice physicians	2,848	4.2%
Other physician specialties	882	1.3%
Nurse practitioners	5,308	7.9%
Physician assistants	9,890	14.7%
Total emergency medicine practitioners, 2018	67,267	100%

The number for emergency physicians includes all emergency physicians billing for 11 or more emergency medicine Medicare Part B claims in 2018; for all others, only those with 50 or more emergency medicine claims in 2018 are included.

services. Combining all nonemergency physician bills, the annual rate of decrease of nonemergency physicians from 2012 to 2018 was 2.5%. A 2% annual net loss of these providers from the workforce would result in a decline from 4,809 in 2018 to 3,774 in 2030.

Number of nurse practitioners and physician assistants

The average annual rate of increase of nurse practitioners/physician assistants between 2012 and 2018 was 8.9% based on providers billing Medicare Part B for 50 or more emergency medicine services in a year. Growth in each year was highest among nurse practitioners (Table 2).

Future Changes in Number of Persons Entering and Leaving the Workforce

Emergency medicine-trained physician inflow

From 2008 to 2020, the number of graduates from emergency medicine residencies increased by over

Table 2. Past trends in nurse practitioners and physician assistants billing Medicare for emergency services.

Year	NPs	PAs	Total	NP Growth	PA Growth	Total APP Growth
2012	2,665	6,456	9,121			
2013	2,999	7,160	10,159	12.5%	10.9%	11.4%
2014	3,359	7,668	11,027	12.0%	7.1%	8.5%
2015	3,874	8,178	12,052	15.3%	6.7%	9.3%
2016	4,514	9,016	13,530	16.5%	10.2%	12.3%
2017	5,041	9,536	14,577	11.7%	5.8%	7.7%
2018	5,308	9,890	15,198	5.3%	3.7%	4.3%

APP, advanced practice provider; NP, nurse practitioner; PA, physician assistant. Based on providers billing Medicare Part B for 50 or more emergency medicine services in year.

60%. Projecting this to 2030, we modeled 0%, 2%, and 4% growth showing projections of inflow of graduates of emergency medicine programs in 2030 (Figure 1).

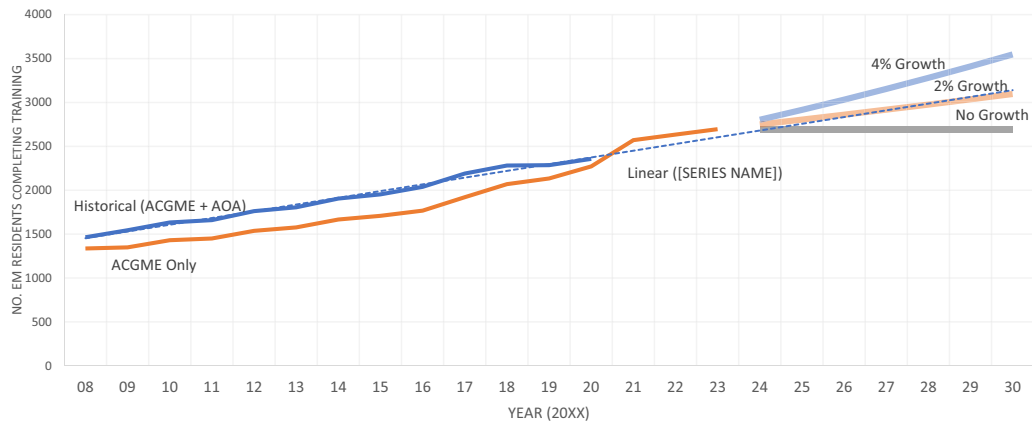
Emergency-trained physician attrition

For this model, the impact of varied net annual attrition was shown for rates of 2%, 3%, and 4%. We also considered varied annual graduate medical education growth rate (0%, 2%, and 4%) to determine the ultimate number of emergency physicians in 2030. With 2% graduate medical education growth and 3% annual attrition—the scenario used in our analysis—there would be 59,050 emergency physicians in 2030 (Table 3).

Estimates of Demand for Emergency Services

Medical Expenditure Panel Survey, National Hospital Ambulatory Medical Care Survey, and NEDS data (2014 to 2018) were used to determine historic ED use. NEDS data were used for this model because of its reporting of age group-stratified data. All scenarios use age-specific use rates from 2017, the most recent data available at the time of the study. Final demand projections varied by percent of encounters seen by nurse practitioners and physician assistants and 0% versus -2% versus -5% change in overall ED utilization (Table 4). 2017 age-specific use rates were applied to the Census Bureau Projections for 2030 and used to calculate the total ED visits in 2030 (Table 5).

Those use rates applied to the projected US population in 2030 would lead to an increase of 13.4% in ED use relative to 2018 (Figure 2). The proposed most likely total visits of 2% less would result in an increase of ED visits in 2030 of 11.2% relative to 2018 (Figure 2). Despite an



Year	Total Grads in 2030				
	Historical (ACGME + AOA)	ACGME Only	No Growth	2% Growth	4% Growth
2008	1464	1336			
2009	1544	1349			
2010	1633	1430			
2011	1660	1450			
2012	1762	1537			
2013	1806	1576			
2014	1905	1667			
2015	1953	1709			
2016	2038	1768			
2017	2190	1921			
2018	2281	2070			
2019	2286	2134			
2020	2357	2272			
2021	2571				
2022	2634				
2023	2696				
2024			2696	2750	2804
2025			2696	2805	2916
2026			2696	2861	3032
2027			2696	2918	3154
2028			2696	2976	3280
2029			2696	3036	3411
2030			2696	3097	3547

Figure 1. Historical trends and projected growth of emergency medicine residents completing training, 2008 to 2030. Projected visits in 2030 based on age-specific use rates in 2017 and projected population in 2030 = 13.4% growth; a decrease of 2% in total visits = 11.2% growth; and a 5% decrease in total visits = a 7.8% growth.

attenuation in the rate of rise in ED visits, the aggregate US ED encounters are still projected to increase from 2018 to 2030, which would be driven by the increased US population—especially the population over age 75—despite a slight relative decrease in overall emergency utilization. When all parameters are combined (11.2% visit increase; 20% of visits seen by nurse practitioners and physician assistants), the demand for emergency physicians is projected to be 51,205 (Table 6, scenario 4).

Final Supply and Demand Model Results

Based on the available information, the task force consensus is that a final model involving the scenario is described by: 2% annual graduate medical education growth, 3% annual emergency physician attrition, 20%

encounters seen by nurse practitioners or physician assistants, and 11.2% increase in ED visits relative to 2018.

To understand whether the projected supply of emergency medicine-trained physicians in 2030 is likely to meet, exceed, or fall short of demand, the projected number of emergency medicine services was compared to the demand for emergency physicians. The demand for emergency physicians needed to provide the projected services in 2030 was compared to the projected supply of emergency physicians.

$$\begin{aligned}
 & (0.85 \times 2030 \text{ ED visits}) / \\
 & (\text{Base supply of emergency and nonemergency physicians}) \\
 & (0.85 \times 143,454,430) / (47,260 + 4,809) \\
 & = 2,342 \text{ (visits/year/physician)}
 \end{aligned}$$

Table 3. Projected supply of emergency physicians in 2030.

Emergency Physicians	Baseline Supply, 2018	Projected Supply, 2030	% Growth
A. 4% GME growth 2023-2030			
4% attrition	47,260	54,796	16%
3% attrition	47,260	60,183	27%
2% attrition	47,260	66,142	40%
B. 2% GME growth			
4% attrition	47,260	53,691	14%
3% attrition	47,260	59,050	25%
2% attrition	47,260	64,979	37%
C. No GME growth			
4% attrition	47,260	52,660	11%
3% attrition	47,260	57,990	23%
2% attrition	47,260	63,891	35%

GME, graduate medical education.

The rates of growth for GME reflect the rate between 2023 and 2030.

This model projected an emergency physician surplus of 7,845 emergency physicians in 2030 (Table 6, scenario 4).

A shortage of 2,855 was predicted in scenario 1, with 0% growth in graduate medical education, 4% attrition of emergency physicians, no change in the proportion of encounters seen by nurse practitioners and physician assistants, and no decline in ED utilization. Under markedly different assumptions, there could be a surplus of 14,937 emergency physicians (in scenario 4, with 4% growth in graduate medical education, 2% attrition, the visits seen by nurse practitioners and physician assistants at 20%, and a 2% lower ED utilization growth [11.2% increase]).

LIMITATIONS

Workforce projections are dependent on the accuracy and stability of the assumptions as well as the accuracy of the baseline data. Any intervention or change in the

model's assumptions will alter the ultimate determination of a surplus or deficit as well as the magnitude of that finding. The potential errors of the assumptions create uncertainty of measurement; thus, the best case, worst case, and most likely scenarios were determined. Arguments can be posited for adjusting nearly every assumption, and such a critical conversation should occur within the specialty. Nonetheless, many more assumptions would need to be altered in order for a shortage to exist.

We assume that the baseline supply of providers currently meets the demand for emergency medicine services. This assumption is common in workforce projections and is based on the premise that the marketplace has created a point of sufficient equilibrium.

The imprecision in quantifying the ranges of full-time and part-time physicians is another limitation. The contribution of direct patient care by each physician is

Table 4. Final demand projections varied by percent encounters seen by nurse practitioners and physician assistants and 0% versus -2% versus -5% change in overall ED utilization.

Scenario	Demand Scenario	Projected Visits in 2030	Projected Demand in 2030
Total visits based on 2017 visit rates and current population projections for 2030 (+12.8%)			
Scenario 1	15% of patients seen by APP only	162,724,227	55,515
Scenario 2	20% of patients seen by APP only	162,724,227	52,250
Total visits 2% less (+10.1%)			
Scenario 3	15% of patients seen by APP only	159,469,742	54,405
Scenario 4	20% of patients seen by APP only	159,469,742	51,205
Total visits 5% less (+6.8%)			
Scenario 5	15% of patients seen by APP only	154,588,016	52,740
Scenario 6	20% of patients seen by APP only	154,588,016	49,637

Table 5. Historical NEDS age-specific use rates.

Age Group	2014	2015	2016	2017
0-17	0.35	0.38	0.39	0.36
18-44	0.48	0.48	0.48	0.46
45-64	0.39	0.40	0.40	0.41
65-74	0.42	0.44	0.43	0.45
75+	0.72	0.77	0.73	0.77

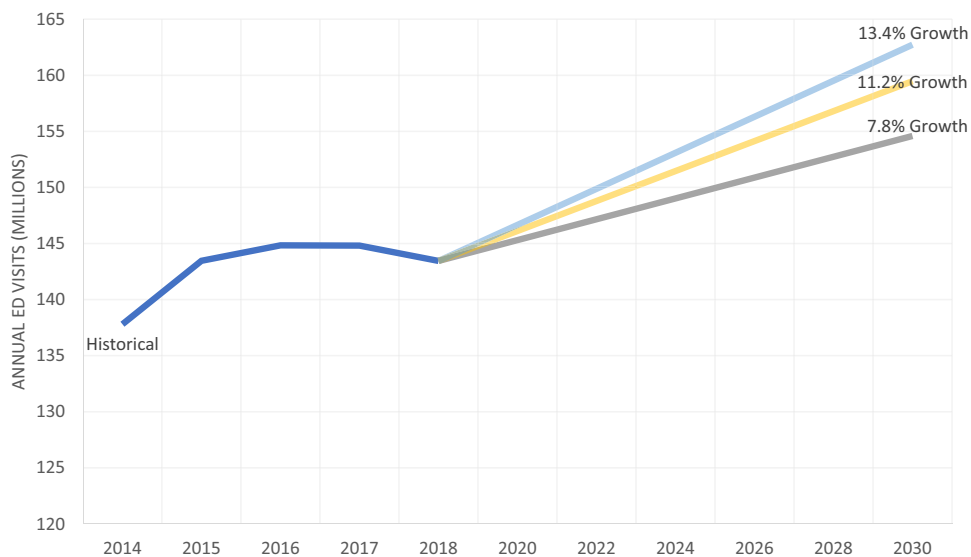
2017 age-specific use rates applied to Census Bureau Projections for 2030 used to calculate total ED visits in 2030.

variable. The study included the number of physicians submitting Medicare emergency medicine bills, emergency physicians submitting Medicare nonemergency medicine

bills, and emergency physicians found in the AMA Masterfile who did not submit any Medicare bills to determine the average number of patients seen per physician as an aggregate index of work production.

Another limitation is a determination of the physician supply when relying nearly exclusively on the AMA Masterfile. The AMA Masterfile may minimize the number of osteopathic physicians (who have a lower capture rate in this database). The Medicare billing records may miss physicians who are caring for patients in the Veterans Affairs health system, the Indian Health Service, or sites with few Medicare patients, such as pediatric EDs.

This study did not specifically model geographic diffusion. Geographic maldistribution currently exists



Year	ED Visits			
	Historical	7.8% Growth	11.2% Growth	13.4% Growth
2014	137,803,068			
2015	143,464,093			
2016	144,832,278			
2017	144,812,097			
2018	143,454,430	143,454,430	143,454,430	143,454,430
2020				
2022				
2024				
2026				
2028				
2030		154,588,016	159,469,742	162,724,227

Figure 2. Historical ED visits, 2014 to 2018 (NEDS) and projected visits, 2014 to 2030. Projected visits in 2030 based on age-specific use rates in 2017 and projected population in 2030 = 13.4% growth; a decrease of 2% in total visits = 11.2% growth; and a 5% decrease in total visits = a 7.8% growth.

Table 6. Final demand projections varied by percent encounters seen by nurse practitioners and physician assistants and 0% versus –2% versus –5% change in overall ED utilization.

Scenario	Demand Scenario	Projected Visits in 2030	Projected Demand in 2030
Total visits based on 2017 visit rates and current population projections for 2030 (+12.8%)			
Scenario 1	15% of patients seen by NP/PA only	162,724,227	55,515
Scenario 2	20% of patients seen by NP/PA only	162,724,227	52,250
Total visits 2% less (+10.1%)			
Scenario 3	15% of patients seen by NP/PA only	159,469,742	54,405
Scenario 4	20% of patients seen by NP/PA only	159,469,742	51,205
Total visits 5% less (+6.8%)			
Scenario 5	15% of patients seen by NP/PA only	154,588,016	52,740
Scenario 6	20% of patients seen by NP/PA only	154,588,016	49,637

and is likely to be amplified in the future.^{6,16} Certain job markets are near or at saturation, while other, “less desirable” job markets are relatively open. In a prior study, 31% of US EDs had fewer than 10,000 annual visits; 80% of those EDs were located in rural areas and accounted for 6% of all ED visits in the United States.¹⁷ Rural EDs are experiencing changing utilization rates and are serving larger proportions of disadvantaged groups.¹⁸ This substantial sector of EDs might be resistant to the influx of emergency medicine-trained physicians. In addition, emergency medicine-trained physicians might be reluctant to practice in these low-volume venues.

The impact of ED crowding was not integrated into the projection model. ED crowding has an unfavorable impact on physician wellness and career desirability as well as potential financial and regulatory effects. ED crowding is likely to persist, and any impact on the future workforce is unknown.

Finally, the precision of any workforce projection is dependent on the ability to adjust assumptions over time. Any long-term workforce projection should adjust input data and assumptions relatively frequently. Revisiting the data and assumptions in this model should occur no later than 5 years from the baseline sample.

DISCUSSION

The history of the specialty of emergency medicine has been an inadequate workforce growing to catch up to the needs of the country. The specialty has now transitioned to a new phase, and the emphasis must shift from growth to maintenance of the appropriate workforce. Based on the best and most recent data, the United States will have a moderate surplus of emergency physicians by 2030.

This unique study of the emergency medicine workforce utilized many sources of existing data, including estimates of the baseline workforce supply of physicians, nurse practitioners, and physician assistants; estimates of future changes in the raw numbers of persons entering and leaving that workforce; estimates of the productivity of the workforce; and estimates of the demand for emergency care services.

Supply of Physicians

There is consensus of an overall shortage of physicians in the United States.¹⁹ In response, the Association of American Medical Colleges has promoted increasing medical school capacity by a third, from 16,488 to 22,239 between 2002 and 2020.²⁰ New osteopathic colleges and expansion of existing schools increased the number of incoming osteopathic students from 4,950 in 2008 to 8,442 in 2018.²¹ The result is a growing number of medical students considering emergency medicine as a career.

The Growth of Emergency Medicine Residency Training

As a new specialty, emergency medicine residencies in the 1970s and 1980s were few relative to the number of EDs. The number and size of new residency programs has continued to expand. There are now 273 ACGME-accredited emergency medicine residencies, while between 2005 and 2019, the number of accredited emergency medicine training programs doubled from 133 to 265 (which includes approximately 50 already existing AOA-accredited programs that converted to the ACGME accreditation format between 2015 and 2020).^{22,23}

Demand for Emergency Physicians

Traditional predictions of demand for emergency physicians have focused on clinical services provided in hospital EDs. The growing demand for ED use has been driven by an aging population. Should ED use follow the current trajectory, a surplus of emergency physicians would be realized later and to a lesser degree than projected. While other career opportunities for emergency physicians expand, clinical care in the ED will continue as the largest practice setting.^{11,24}

Factors such as telemedicine, urgent care and other alternative venues to seek care, changes in insurance coverage and payment models, and the ongoing sequelae of COVID-19 may affect ED use that in a way that alters the projections found from this model. After trying to balance these effects, an overall increase from 143 million hospital ED visits in 2018 to 159 million visits in 2030 (an 11.2% growth) was projected.

Population Projections

Recent data from the Census Bureau showed relatively low birth rates and immigration rates—the 2 major drivers of population growth. The 2020 Census is likely to report the lowest population growth rate over the past decade in America's history.²⁵ Based on these developments, the population in 2030 may be lower than previously projected, which could slow the increasing demand for ED services.

The Role of Nurse Practitioners and Physician Assistants

From 2012 to 2018, the total growth and use of nurse practitioners and physician assistants in the ED increased by 66%. The number of nurse practitioners grew by 99%, while the number of physician assistants increased by 53%. Assuming a steady annual growth rate of approximately 8%, there will be 38,271 nurse practitioners and physician assistants providing emergency medicine care by 2030. In many settings, nurse practitioners and physician assistants manage lower-acuity patients or provide higher-acuity care using clearly delineated protocols.⁷ Based on current growth trends, nurse practitioners and physician assistants are likely to manage 20% of ED visits. However, the supply and demand curves of emergency physicians, nurse practitioners, and physician assistants are interrelated. Oversupply or decreased compensation models for one group will affect demand for the others. Training, certification, scope of practice, and regulation of nurse practitioners and physician assistants vary widely,²⁶⁻³⁰ and since roles and privileges are typically designated by organizational policies and hospital bylaws, supervision requirements also vary.^{31,32} Emergency-specific preparation

and board certification of physician assistants and nurse practitioners is increasing and is encouraged in order to provide a higher quality of care as part of the emergency medicine team.^{30,33}

Demand for Emergency Physicians in Other Settings

Urgent care clinics, retail clinics. Over the last 2 decades, urgent care and retail clinics have expanded as sites for unscheduled care. It has been estimated that 14% to 27% of all ED visits could have appropriately been seen in an urgent care or retail clinic.³⁴ Studies evaluating the impact of urgent care and retail clinics on ED use have been mixed. While one study demonstrated no association between ED use and the density of urgent care and retail clinics, others have shown that urgent care centers may decrease the number of low-acuity ED visits.³⁵⁻³⁷

While these studies suggest that alternative venues may decrease the proportion of low-acuity visits seen in the ED, the overall number of ED visits increased during this period, suggesting both a greater proportion and absolute number of high-acuity ED visits. Another study projecting ED use suggested that ED visits would remain on pace with population growth but that the aging population would increase visit lengths and the likelihood of hospitalization.³⁸

Freestanding or satellite EDs. Recently, freestanding EDs have been allowed in some states—notably, Texas, Colorado, and Ohio.³⁹ Independent centers, including those owned by emergency physicians, are neither recognized by nor reimbursed by Medicare,⁴⁰ although the Centers for Medicare & Medicaid Services is making an exception during the pandemic. Insurance companies and payors see these as more expensive than other outpatient options.⁴¹

While freestanding facilities are currently in urban areas with high insurance penetration, this model may be one way to provide future emergency care to underserved and rural areas.⁴² It is possible that freestanding models will thrive in the future with health care's focus on increasing outpatient care, or they may be considered more costly as health care reimbursement systems evolve.

Whether a patient uses the ED or an alternative care site depends on numerous factors, such as cost and accessibility issues (eg, geographic distance, proximity to public transportation). External forces such as the reimbursement system and government and regulators restricting or supporting emergency care also play an important role. Factors increasing demand within emergency medicine control include new models of care, movement into subspecialties, expanding use of telehealth, evolution of

satellite EDs, and new treatments developed by emergency physicians.

In summary, for the first time in its history, emergency medicine is facing the likely oversupply of emergency physicians in 2030. There are many factors, some of which are uncertain, that affect the increasing supply and changing demand for emergency physicians. An organized, collective approach by the specialty of emergency medicine is imperative to produce a balanced workforce that can effectively and efficiently care for the emergency medical needs of the American public.

The authors thank Leo Quigley, PhD, MPH, Sara Westergaard, MD, MPH, and Leah Masselink, PhD, for their assistance with data analysis.

Supervising editor: Donald M. Yealy, MD. Specific detailed information about possible conflict of interest for individual editors is available at <https://www.annemergmed.com/editors>.

Author affiliations: From the Department of Emergency Medicine (Marco), Wright State University Boonshoft School of Medicine, Dayton, OH; the Department of Emergency Medicine (Courtney), UT Southwestern Medical Center, Dallas, TX; the Department of Emergency Medicine, Hennepin County Medical Center (Ling), University of Minnesota, Minneapolis, MN; the George Washington University Fitzhugh Mullan Institute for Health Workforce Equity (Salsberg, Richwine), Washington, DC; the American Board of Emergency Medicine (Reisdorff), East Lansing, MI; the Department of Emergency Medicine (Gallahue), The University of Washington, Seattle, WA; the Department of Emergency Medicine, University of Texas Southwestern, Dallas, TX, the Department of Community Medicine (Suter), Oklahoma State University, Tulsa, OK; the Department of Military Medicine (Suter), Uniformed Services University of the Health Sciences, Bethesda, MD; the Department of Emergency Medicine (Muelleman), University of Nebraska Medical Center, Omaha, NE; the Department of Emergency Medicine (Chappell), Harbor-UCLA Medical Center, David Geffen School of Medicine at UCLA, Los Angeles, CA; the Emory University Nell Hodgson Woodruff School of Nursing (Evans), Atlanta, GA; and the Emergency Medicine Residents' Association (EMRA) (Vafaie), Dallas, TX.

Author contributions: CAM, DMC, LIL, ES, EJR, FEG, RES, BC, DDE, NV, and CR conceived and designed the study, interpreted analysis of data, drafted portions of the manuscript, and critically revised the final manuscript. ES and CR developed data collection tools, analyzed the results, and wrote portions of the manuscript. CAM is responsible for the paper as a whole.

Authorship: All authors attest to meeting the 4 [ICMJE.org](http://www.icmje.org) authorship criteria: (1) Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND (2) Drafting the work or revising it critically for important intellectual content; AND (3) Final approval of the version to be published; AND (4) Agreement to be accountable for all aspects of the work in ensuring that questions

related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Funding and support: By *Annals* policy, all authors are required to disclose any and all commercial, financial, and other relationships in any way related to the subject of this article as per ICMJE conflict of interest guidelines (see www.icmje.org). The authors have stated that no such relationships exist. ES and CR received funding from the American College of Emergency Physicians, American Board of Emergency Medicine, American College of Osteopathic Emergency Physicians, American Osteopathic Board of Emergency Medicine, Council of Emergency Medicine Residency Directors, Emergency Medicine Residents' Association, and Society for Academic Emergency Medicine for the data acquisition and analysis.

Publication dates: Received for publication March 10, 2021. Revision received April 22, 2021. Accepted for publication May 25, 2021.

REFERENCES

1. Zink BJ. *Anyone, Anything, Anytime: A History of Emergency Medicine*. 2nd edition. American College of Emergency Physicians; 2018:ix,35.
2. Number of Accredited Programs by Academic Year. Accreditation Council for Graduate Medical Education. Accessed February 9, 2021. <https://apps.acgme.org/ads/Public/Reports/Report/3>.
3. Moorhead JC, Gallery ME, Mannie T, et al. A study of the workforce in emergency medicine. *Ann Emerg Med*. 1998;31:595-607.
4. Moorhead JC, Gallery ME, Hirshkorn C, et al. A study of the workforce in emergency medicine: 1999. *Ann Emerg Med*. 2002;40:3-15.
5. Counselman FL, Marco CA, Patrick VC, et al. A study of the workforce in emergency medicine: 2007. *Am J Emerg Med*. 2009;27:691-700.
6. Bennett CL, Sullivan AF, Ginde AA, et al. National study of the emergency physician workforce, 2020. *Ann Emerg Med*. 2020;76:695-708.
7. Hall MK, Burns K, Carius M, et al. State of the national emergency department workforce: who provides care where? *Ann Emerg Med*. 2018;72:302-307.
8. Camargo CA Jr, Ginde AA, Singer AH, et al. Assessment of emergency physician workforce needs in the United States, 2005. *Acad Emerg Med*. 2008;15:1317-1320.
9. Clay CE, Sullivan AF, Bennett CL, et al. Supply and demand of emergency medicine board-certified emergency physicians by US state, 2017. *Acad Emerg Med*. 2021;28:98-106.
10. Reiter M, Wen LS, Allen BW. The emergency medicine workforce: profile and projections. *J Emerg Med*. 2016;50:690-693.
11. Reiter M, Allen BW. The emergency medicine workforce: shortage resolving, future surplus expected. *J Emerg Med*. 2020;58:198-202.
12. Medicare Provider Utilization and Payment Data: Physician and Other Supplier. Centers for Medicare and Medicaid Services. Accessed June 30, 2021. <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Provider-Charge-Data/Physician-and-Other-Supplier>.
13. AMA Physician Masterfile. American Medical Association. Accessed April 20, 2021. <https://www.ama-assn.org/practice-management/masterfile/ama-physician-masterfile>.
14. Bai G, Kelen GD, Frick KD, et al. Nurse practitioners and physician assistants in emergency medical services who billed independently, 2012-2016. *Am J Emerg Med*. 2019;37:928-932.
15. National Emergency Department Sample: Overview: EM Current Procedural Terminology (CPT) codes 99281-99285.

16. Hansroth J, Findley SW, Quedado KD, et al. Evaluating West Virginia's emergency medicine workforce: a longitudinal observational study. *Cureus*. 2021;13:e13639.
17. Muelleman RL, Sullivan AF, Espinola JA, et al. Distribution of emergency departments according to annual visit volume and urban-rural status: implications for access and staffing. *Acad Emerg Med*. 2010;17:1390-1397.
18. Greenwood-Ericksen MB, Kocher K. Trends in emergency department use by rural and urban populations in the United States. *JAMA Netw Open*. 2019;2:e191919.
19. Zhang X, Lin D, Pforsich H, et al. Physician workforce in the United States of America: forecasting nationwide shortages. *Hum Resour Health*. 2020;18:8.
20. 2020 Fall Applicant, Matriculant, and Enrollment Data Tables. Association of American Medical Colleges. Accessed April 20, 2021. <https://www.aamc.org/media/49911/download>.
21. AACOM Report: US Osteopathic Medical Schools by Year of Inaugural Class. American Association of Colleges of Osteopathic Medicine. Accessed April 20, 2021. https://www.aacom.org/docs/default-source/data-and-trends/number_coms_report.pdf?sfvrsn=b58a0b97_8.
22. Nelson LS, Keim SM, Ankel FK, et al. American Board of Emergency Medicine report on residency and fellowship training information (2019-2020). *Ann Emerg Med*. 2020;75:648-667.
23. ACGME Data Resource Book. Accreditation Council for Graduate Medical Education. Accessed February 7, 2021. <https://www.acgme.org/About-Us/Publications-and-Resources/Graduate-Medical-Education-Data-Resource-Book>.
24. Suter RE. Emergency medicine in the United States: a systemic review. *World J Emerg Med*. 2012;3:5-10.
25. What the 2020 census will reveal about America: Stagnating growth, an aging population, and youthful diversity. Frey WH. Accessed January 13, 2020. https://www.brookings.edu/research/what-the-2020-census-will-reveal-about-america-stagnating-growth-an-aging-population-and-youthful-diversity/?preview_id=1340045.
26. Katz J, Powers M, Amusina O. A review of procedural skills performed by advanced practice providers in emergency department and critical care settings. *Dis Mon*. 2021;67:101013.
27. Wilbeck J, Evans DD, Hoyt KS, et al. Proposed standardized educational preparation for the emergency nurse practitioner. *J Am Assoc Nurse Pract*. 2018;30:579-585.
28. Rudy S, Wilbeck J. Postgraduate emergency nurse practitioner fellowships: opportunities for specialty education. *Adv Emerg Nurs J*. 2017;39:224-230.
29. State Practice Environment. American Association of Nurse Practitioners. Accessed February 22, 2021. <https://www.aanp.org/advocacy/state/state-practice-environment>.
30. NCCPA's CAQ in Emergency Medicine. Society for Emergency Medicine Physician Assistants. Accessed February 22, 2021. <https://www.sempa.org/professional-development/nccpas-caq-in-emergency-medicine/>.
31. Wiler JL, Ginde AA. State laws governing physician assistant practice in the United States and the impact on emergency medicine. *J Emerg Med*. 2015;48:e49-e58.
32. Clark A, Amanti C, Sheng AY. Supervision of advanced practice providers. *Emerg Med Clin North Am*. 2020;38:353-361.
33. Tyler DO, Hoyt KS, Evans DD, et al. Emergency nurse practitioner practice analysis: report and implications of the findings. *J Am Assoc Nurse Pract*. 2018;30:560-569.
34. Society for Emergency Medicine Physician Assistants, NCCPA's CAQ in emergency medicine. Accessed February 22, 2021. <https://www.sempa.org/professional-development/nccpas-caq-in-emergency-medicine/>.
35. Alghamdi K, Zocchi M, Frohna WJ, et al. The 2013 dip: factors influencing falling emergency department visits and inpatient admissions in District of Columbia and Maryland. *J Emerg Med*. 2016;50:897-901.
36. Llovera I, Loscalzo K, Gao J, et al. Increased access to urgent care centers decreases low acuity diagnoses in a nearby hospital emergency department. *Am J Emerg Med*. 2019;37:486-488.
37. Poon SJ, Schuur JD, Mehrotra A. Trends in visits to acute care venues for treatment of low-acuity conditions in the United States from 2008 to 2015. *JAMA Intern Med*. 2018;178:1342-1349.
38. Pallin DJ, Allen MB, Espinola JA, et al. Population aging and emergency departments: visits will not increase, lengths-of-stay and hospitalizations will. *Health Aff (Millwood)*. 2013;32:1306-1312.
39. Gutierrez C, Lindor RA, Baker O, et al. State regulation Of freestanding emergency departments varies widely, affecting location, growth, and services provided. *Health Aff (Millwood)*. 2016;35:1857-1866.
40. The Medicare Payment Advisory Commission. Stand-alone emergency departments. In: Report to the Congress: Medicare and the Health Care Delivery System. Accessed February 19, 2021. http://www.medpac.gov/docs/default-source/reports/jun17_ch8.pdf.
41. Patidar N, Weech-Maldonado R, O'Connor SJ, et al. Freestanding emergency departments are associated with higher Medicare costs: a longitudinal panel data analysis. *Inquiry*. 2017;54:46958017727106.
42. Alexander AJ, Dark C. Freestanding emergency departments: what is their role in emergency care? *Ann Emerg Med*. 2019;74:325-331.