

Workforce Needs and Demands in Surgery



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KEYWORDS

- Surgical training • Graduate medical education • General surgery
- Surgical workforce

KEY POINTS

- The rapidly evolving health care environment will place enormous pressure on the surgical training systems of today and thereby influence the surgical workforce of tomorrow.
- Despite the controversy about the workforce adequacy, it is highly probable that we will face a shortage of general surgeons or surgeons that perform general surgical procedures in the future.
- It is unlikely that the surgical workforce of the future can be augmented without significantly increasing the number of residency positions which seems improbable in the current environment.
- The surgical community needs to demonstrate strong leadership to develop innovative models of graduate medical education that will ensure an adequate surgical workforce for the future.

INTRODUCTION

Around the turn of 19th century, William Stewart Halsted, ([Fig. 1](#)) the first surgeon-in-chief at The Johns Hopkins Hospital, was laying the foundation of what would become one of the most durable models of postgraduate training for physicians in the history of medical education. The existing systems of that time consisted of apprentice models of varying types with no consistency in length, structure, supervision, or assessment of competency prior to entering practice. Halsted's dissatisfaction with the existing systems, combined with the knowledge he acquired during his European travels, sowed the seeds for the Halstedian model. This model consisted of a structured training model over a finite period of time with supervision and progressive assumption of increasing responsibility until acquisition of competence prior to entering practice.

The attractiveness of this model and proven efficacy led to its approval by the American Medical Association House of Delegates in 1928 as the preferred model

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Fig. 1. Dr William Stewart Halsted.

for approving hospital-based residencies in specialties.¹ The resilience of this model is demonstrated by the fact that not only did it become the platform for surgical training, but for training in all specialties, and with some minor modifications, it is the predominant model for training postgraduate physicians worldwide.

The past 2 decades have brought forth more changes to the field of surgery than the entire previous century. This includes the introduction of minimally invasive techniques, adoption of duty hour rules and regulations, new regulations driven by elected officials and the public, demands for delivering value for the investments in graduate medical education, and changing sociocultural fabric with increasing population of greater linguistic diversity. Although the Halstedian model still holds value, surgical training models of the future need to demonstrate preternatural flexibility to adapt to the unending cycle of change and still produce surgeons of competence. This is extremely important, since good surgical training pathways of today contribute to pipelines that generate the surgical workforce of tomorrow.

An adequate surgical workforce is the core requirement to provide adequate surgical services to any nation. An ideal surgical workforce should consist of an adequate number of competent surgeons trained across all specialties that is distributed on a needs basis across the entire nation. Several concerns have been raised in recent times about the competence of trainees, adequacy of graduates, and the uneven distribution of surgical workforce across the nation. Concerns such as these about the workforce lead to question the validity of current surgical training paradigms and whether they are structured to meet the workforce needs of the future. Unless one addresses the issues burdening the surgical training systems of today, the problems associated with the surgical workforce of tomorrow will go unsolved.

The aims of this article are to

1. Develop an understanding of the definitions and dynamics of surgical workforce and provide an overview of the current trends/issues in surgical workforce
2. Present the current model of training from medical school to practice with some suggested changes to the training system of today to address issues with the surgical workforce of tomorrow; for the purposes of this article, the focus will be placed on training during general surgery residency and workforce of general surgeons.

DEFINITIONS AND DYNAMICS OF SURGICAL WORKFORCE AND OVERVIEW OF CURRENT TRENDS AND ISSUES

Current Workforce Data

Workforce is defined as “the people engaged in or available for work, either in a country or area or in a particular company or industry.”² The Bureau of Labor Statistics documented that the number of jobs for physicians and surgeons in the year 2012 equaled 691,400.³ This figure is approximately similar to the data published by the American College of Surgeons Health Policy Research Institute (ACS HPRI), which noted the total number of physicians for the year 2009 to be 694,843.⁴ Further analysis by ACS HPRI reveals data on the surgical workforce as outlined in **Table 1**. There are 28,926 general surgeons, accounting for approximately 4.1% of the physician workforce in the nation.

Change in Workforce Numbers

The change in workforce numbers between the years 2005 and 2009 is outlined in **Table 2**⁴ and reveals alarming trends for the general surgeon workforce. Although general surgery subspecialties witnessed a growth of nearly 21%, the growth in general surgery alone stood at 0.2%.⁴ General surgery subspecialties consisted of abdominal surgery, surgical critical care, hand surgery, oral and maxillofacial surgery, pediatric surgery, surgical oncology, trauma surgery, transplant surgery, vascular surgery, cardiovascular surgery, and pediatric surgical subspecialties.

Distribution of the Surgical Workforce in the United States

The American College of Surgeons Health Policy Institute provides data on distribution of the surgical workforce based on the number of counties.⁵ The data are categorized as 2 groups: all surgeons and general surgeons only, and is provided as the number of

Table 1
Physician/Surgeon workforce in the United States for 2009

Specialty		Total Active Physicians
All specialties		694,843
All surgical specialties		135,854
General surgery	Composite ^a	28,926
	General surgery alone	22,486
	General surgery subspecialties	6440

^a Composite = General surgery alone + general surgery subspecialties.

Data from The surgical workforce in the United States: profile and recent trends. American College of Surgeons Health Policy Research Institute. Available at: http://www.acshpri.org/documents/ACSHPRI_Surgical_Workforce_in_US_apr2010.pdf. Accessed June 14, 2015.

Table 2 Percentage change in the surgical workforce for 2009 when compared with 2005		
Specialty		Total Active Physicians (% Change)
All specialties		+ 7.8%
All surgical specialties		+ 2.6%
General surgery	Composite ^a	+ 4.2%
	General surgery alone	+ 0.2%
	General surgery subspecialties	+ 20.9%

^a Composite = General surgery alone + general surgery subspecialties.

Data from The surgical workforce in the United States: profile and recent trends. American College of Surgeons Health Policy Research Institute. Available at: http://www.acshpri.org/documents/ACSHPRI_Surgical_Workforce_in_US_apr2010.pdf. Accessed June 14, 2015.

surgeons per 100,000 population in each county within the United States. The data include nonfederal, nonresident, clinically active physicians less than 80 years of age reporting their primary specialty as “surgery” or “general surgery.” These data, revised on Oct. 12, 2012, cover the period from 2006 to 2011 and are summarized in **Table 3**. Although the pattern of uneven distribution is evident nationwide for all surgical specialties, this trend is much worse for the distribution of general surgeons. The number of counties with at least 40 general surgeons decreased by almost 33%. Although 128 counties gained a general surgeon in 2011 when compared with 2006, a greater number of counties (206) completely lost all general surgeons.

Table 3 Distribution of surgical workforce in the United States based on the number of counties			
Number of Surgeons in 2006 and 2011			
		All Surgeons/1000,000 Population	General Surgeons Only/100,000 Population
Number of counties with ≥ 40 surgeons	2006	679	12
	2011	668	8
Number of counties with 0.1–4.6 surgeons	2006	84	324
	2011	100	386
Number of counties with no surgeons	2006	841	1066
	2011	898	1144
% Change in Number of Surgeons/100,000 Population Between 2006 and 2011			
		All Surgeons	General Surgeons Only
Number of counties that gained 100% or more surgeons		90	88
Number of counties with no change		1	0
Number of counties with decline in number of surgeons		1051	1139
No surgeons in 2006 but at least 1 surgeon in 2011		136	128
Number of counties that lost all surgeons		193	206

Data from Distribution of surgical workforce in the United States, American College of Surgeons Health Policy Institute. Available at: http://www.acshpri.org/documents/SurgeonMaps2006-2011_Oct2012.pdf. Accessed June 21, 2015.

Number of Some of the Common General Surgical Procedures Performed in the United States

The US Centers for Disease Control and Prevention documented that 51.4 million procedures were performed in the United States in 2010 based on the National Hospital Discharge Survey.⁶ Because this includes a large number of nongeneral surgical procedures such as joint replacements, cesarean section, and cardiac catheterization, further attempts were made to determine the number of general surgical procedures performed annually in the United States. A review of the National Hospital Discharge Survey⁷ documented the data for some common general surgical procedures from short-stay hospitals as outlined in **Table 4**. These data are far from accurate, as they do not include several other common procedures such as hernia repair, and are unlikely to capture data from all in-patient or day-procedure settings. Nonetheless these data provide an approximate measure of the number of some of the common general surgical procedures performed in the United States.

Population Growth in the United States

The number of general surgeons needed to address the surgical needs of the nation is directly proportional to the population. The population growth trends for the United States for the next 45 years are outlined in **Table 5**.⁸ Although the percentage increase shows a decreasing trend, it is noted that the population of United States will increase by an additional 95 million by the year 2060. This increase in the population will most certainly increase the number of general surgical procedures, and thereby increase the need for general surgeons. A 10-year update study by Valentine and colleagues⁹ on general surgery workloads documented an increase in the number of cases performed by general surgeons annually from 398 cases (reporting period from 1995 to 1997) to 533 (reporting period from 2007 to 2009). Although not analyzed in the study, the population of the United States increased in the corresponding time period from 266,490,000 in 1997¹⁰ to 296,824,000 in 2007,¹¹ mirroring the increased number of surgical procedures documented by Valentine and colleagues.

Pipeline for Training General Surgeons

The trends in the number of positions offered for general surgery residency in the matching program for the last 25 years are shown in **Fig. 2**.¹² We noticed a decrease in the number of positions, saddling around the turn of the millennium, with a slight increase in the numbers of positions in most the recent 5-year period. Nonetheless,

Table 4 Number of routine general surgical procedures performed in the United States in 2010		
Type of Procedure	# of Procedures	Standard Error
Partial excision of large intestine	247,000	30
Appendectomy, excluding incidental	305,000	46
Cholecystectomy	429,000	47
Lysis of peritoneal adhesions	356,000	43
Total	1,337,000	—

Data from Center for Disease Control and Prevention. National Hospital Discharge Surgery: 2010 table, procedures by selected patient characteristics—number by procedure category and age. Available at: http://www.cdc.gov/nchs/data/nhds/4procedures/2010pro4_numberprocedureage.pdf. Accessed June 14, 2015.

Table 5 Population projections for the United States		
Year	Population (in Thousands)	Approximate % Increase
2015	321,369	–
2025	347,335	8%
2035	370,338	6.6%
2045	389,394	5.1%
2055	407,412	4.6%
2060	416,795	2.2%

Data from United States Census Bureau, Population Projections. 2014 national population projections: summary tables. Available at: <http://www.census.gov/population/projections/data/national/2014/summarytables.html>. Accessed June 14, 2015.

these changes remain modest and are extremely unlikely to alter the number of graduates and therefore the workforce in any significant fashion.

The interpretation of the previously described data leads to several objective findings:

1. The population of United States is expected to rise significantly.
2. The number of general surgical procedures performed will likely rise.
3. The number of procedures performed by general surgeons is already on the rise.
4. The surgical workforce data demonstrate that the number of general surgeons has remained static, whereas there has been a 20% increase in the number of surgeons in general surgery subspecialties.
5. There is an uneven distribution of the surgical workforce in the United States, with the trends being even more worrisome for general surgeons.
6. The number of training positions in general surgery has not changed significantly over the past 25 years, and therefore the current training model is unlikely to increase the workforce numbers in the near future.

From the previously described data and findings, it appears that there will be a shortage of general surgeons in the future. Although this may seem straightforward from the data provided here, the debate on the topic of physician and general surgeon shortage is conflicting. Public and policy debate on the topic is highly contradictory, which makes it nearly impossible to reach clear and cogent conclusions. Another cause for confusion is the cross-referencing of data on supply and demand between the different specialties, which can lead to misinterpretation of the published findings.

To reach some consensus for this article, reports on physician supply and demand published by one agency, the Bureau of Health Professions, Health Resources and Services Administration (BPHR, HRSA) will be used. The article will refer to sequential reports published by HRSA on physician supply and demand over the last decade (Table 6). Although these reports are published by the same agency, review of the variable findings in the sequential reports illustrates the difficulty in accurately projecting the supply demand curves for the future.

The HRSA published a report on “Physician Supply and Demand: Projections to 2020” in October 2006, which stated that the overall physician supply per capita will remain relatively stable for the next 15 years.¹³ By using the Physician Supply Model (PSM) and Physician Requirement Model (PRM) the report summarized that the overall supply of physicians should be sufficient to meet the expected demand through the next 10 years until 2016. An updated report published in December 2008¹⁴ noted

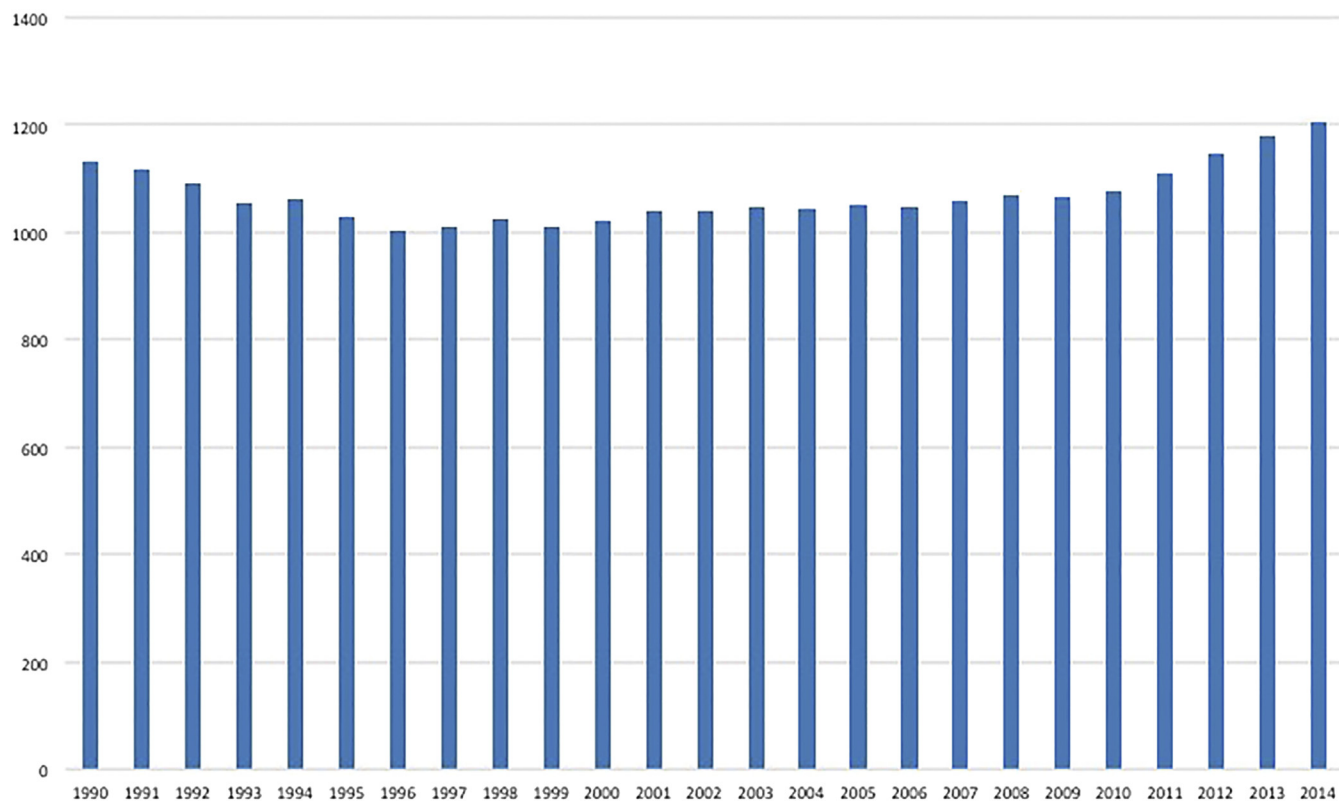


Fig. 2. Trends in positions offered in general surgery residency: 1990–2014.

Table 6 Data on projections of general surgery supply and demand based on reports published by bureau of health professionals, health resources and services administration: 2006 to 2014		
Year Published	Title of Report	Data on General Surgery Demand and Supply
2006	Physician supply and demand: projections to 2020 ¹³	Supply of physicians should be sufficient to meet the expected demand through 2016
2008	The physician workforce: projections and research into current issues affecting supply and demand ¹⁴	Increase in need is greatest in cardiology, internal medicine, and surgical specialties; and shortage is likely unless changes are made
2014	Projecting the supply of nonprimary care specialty and subspecialty clinicians: 2010–2015 ¹⁵	Per capita supply of physicians projected to decline for general surgery, and supply of physicians will not be able to keep up with some specialties such as psychiatry and general surgery

Data from Refs.^{13–15}

that the growth and aging of the population will contribute to a 22% increase in physician services between 2005 and 2020, with the greatest need in cardiology, internal medicine, and most surgical specialties. The report’s summary documented that the overall demand for physician services is growing faster than supply, implying a shortage is likely unless multiple changes are made. The most updated report published in July 2014¹⁵ concludes that there will be a shortage of general surgeons. The report notes that although the per capita supply of physicians will vary by specialty, they are projected to decline for cardiology, psychiatry, and general surgery. The report concludes that the supply of physicians in some critical nonprimary care specialty service areas, such as psychiatry and general surgery, may not keep up with population growth.

In summary, based on the reports published by reputable surgical organizations (ACS HPRI) and governmental agencies (BHPH HRSA), it is reasonable to conclude that there will be a shortage of general surgeons or surgeons who perform general surgical procedures in the future. Unless significant changes are made now, these shortages will only worsen due to the long time period it takes to train general surgeons.

CURRENT MODEL OF TRAINING FROM MEDICAL SCHOOL TO PRACTICE WITH SOME SUGGESTED CHANGES TO THE TRAINING SYSTEMS OF TODAY TO ADDRESS ISSUES WITH THE SURGICAL WORKFORCE OF TOMORROW

For this article, the current model of training will be presented (Fig. 3) with some suggested changes to some stages of this training paradigm. Although many suggested changes may not be rooted in rigid surgical science or backed by policy metrics, most readers should be acquainted with the common sense approach with which surgeons are familiar. Before venturing into the model, some caveats need to be highlighted:

1. The author would like to highlight that surgical training is only one of the factors that affects the surgical workforce. Instead there is a complex interplay of several factors that have a bearing on the future of surgical workforce. Although training and education serve as the pipeline feeding into the bowl of workforce capacity, several post-training factors play a more significant role.

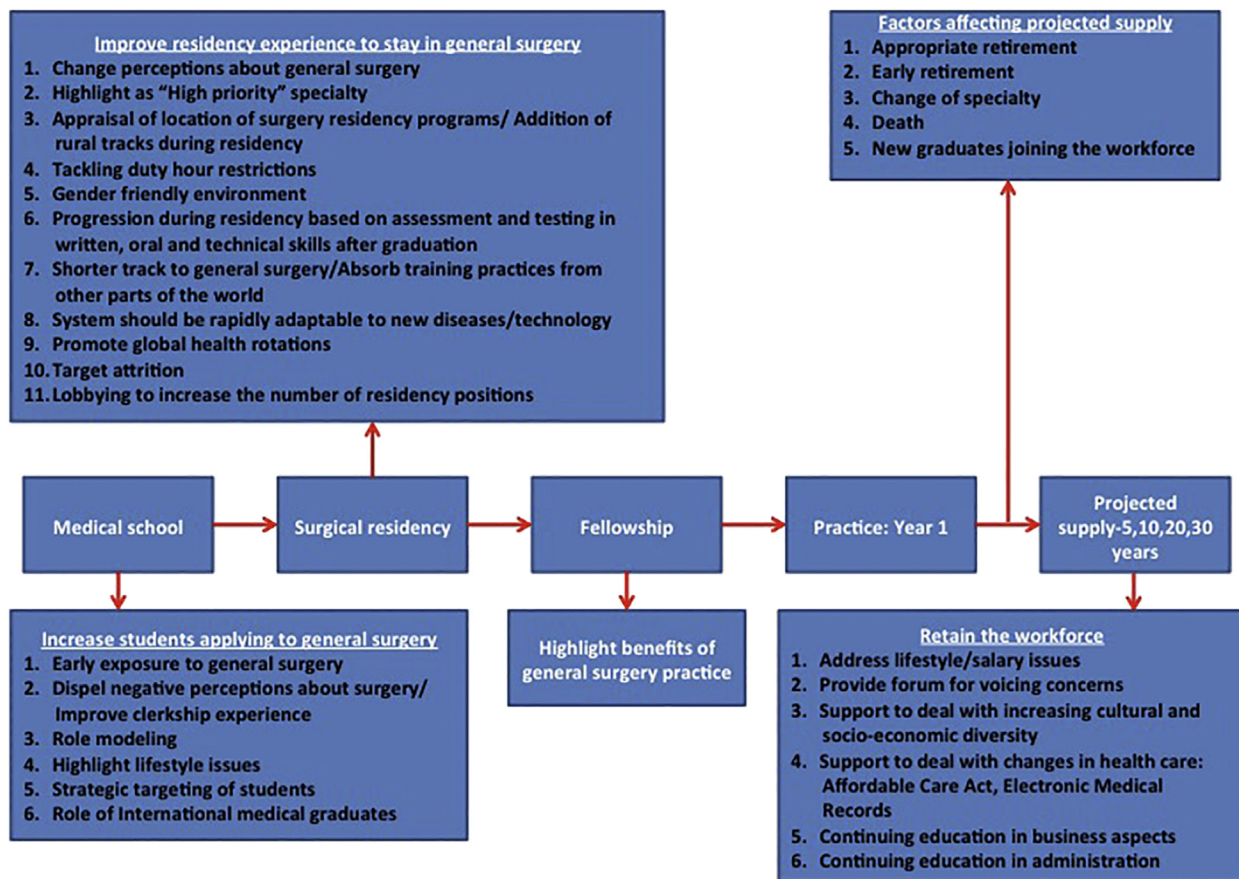


Fig. 3. Current model from medical school to practice with some suggested changes.

2. The scope of practice for a general surgeon is in constant evolution and will continue to do so in the future. Several diseases/procedures that were once in the domain of general surgeon's practice are no longer, such as vascular surgery. In contrast, some procedures that were once in the domain of fellowship-trained surgeons are returning into the fold of a general surgeon's practice. For example, some laparoscopic procedures such as Nissen fundoplication, which were once performed by fellowship-trained surgeons, are now performed by general surgeons in practice with or without additional training. As technology is disseminated more freely, more complex laparoscopic procedures will be performed by surgeons who categorize themselves as general surgeons. The scope of practice for a general surgeon is a highly malleable domain and will continue to cause cross-specialty issues. And this nebulous area of separation between the specialties will always make it difficult to determine the actual number of general surgeons and more importantly who is performing the common general surgical procedures.
3. This model with the suggested changes should by no means be considered as a comprehensive mosaic of solutions to address all issues associated with surgical training or surgical workforce. Instead it should be considered as an initial thought platform that can provide the catapult to initiate debate about how one can shape the future of general surgery training and its resultant workforce.

Review of the model reveals several stages that can have a bearing on the surgical workforce. Emphasis will appropriately be placed on the stages of medical school and residency training. The factors associated with other stages after completion of residency training are briefly mentioned in [Fig. 3](#).

Medical School

The primary theme of this stage is to increase the number of US seniors who apply to general surgery residency. The number of US seniors applying to general surgery residency has declined considerably over the last 3 to 4 decades. Review of the data from National Residency Matching Program reveals that the number of US seniors applying to general surgery has decreased by 56% from 12.8% in 1978¹⁶ to 5.6% in 2014.¹⁷ It is beyond the scope of this article to review all the factors contributing to this trend. But suffice it to say that several major changes have taken place in the interim 4 decades such as the emergence of newly independent specialties such as emergency medicine, emphasis on surgical specialties, and coalescence or divergence of domains of practice between specialties. While all of this is true, it still does not conceal the distressing fact that fewer and fewer US seniors are applying to general surgery residency.

Several strategies have been put in place over the last few years to entice more US seniors to apply to general surgery residency.

Early exposure of medical students to the field of general surgery

It is known that for most medical students, their first exposure to a general surgeon may be in their third year of medical school. The first 2 years of medical school are a lost window of opportunity for surgeons to interact with medical students. Several authors¹⁸⁻²¹ have published their data on curricula that provide the opportunity to interact with first- and second-year medical students. Are and colleagues^{18,19} initiated a new curriculum for first-year medical students that consisted of instruction in management of pancreatic malignancies combined with demonstration of clinically relevant anatomy and pancreaticoduodenectomy by using lightly embalmed cadavers. They noted that nearly 57% of students documented an increase in the likelihood of pursuing a surgical career after watching the surgical demonstration. Patel and

colleagues²⁰ initiated a skills-based curriculum (Surgery Saturday curriculum), targeting the first- and second-year medical students. The number of students planning to apply to surgical residency increased from 42% to 88% prior to and after participation in the Surgery Saturday curriculum. It is easy to be critical of these studies, since they do not follow the linear progression of the students until their match date to see if the increased interest translated to an actual increase in match rate. Haggerty and colleagues²¹ addressed this issue by following the student's career path from 2003 to 2012 after instituting an 8-week structured summer research program for second-year medical students. In addition to research productivity, this curriculum led to 52.2% of the students matching into general surgery, which is much higher than their own institutional rate as well as the national match rates.

Dispel negative perceptions about general surgery/improve clerkship experience

Negative perceptions about the field of surgery and surgeons are developed by medical students for various reasons due to the influence from diverse quarters such as the media, preceptors, and classmates.²² The negative perceptions that preclinical medical students harbor can only be worsened by the experiences during surgical clerkships. Stone and colleagues²³ conducted a survey to identify potential issues that students face during surgical clerkship. The results of their survey document that students perceive intimidation and mistreatment during their surgical clerkships. This included mocking during the operative cases, ridiculing in the presence of others, teaching by humiliation, and physical abuse. These experiences serve as pivotal points that conclusively steer medical students away from ever considering a surgical career. Every attempt should be made to dispel negative perceptions by instituting systematic changes that not only address curricular issues but also ameliorate the prevailing unfavorable culture and attitudes toward medical students.

Role models

Role models play a key role in shaping the career paths of students. Although surgical faculty and residents may underestimate their own influence, applicants and medical students tend to rely on role models for shaping their career paths. Quillin and colleagues²⁴ conducted a survey of third-year medical students and concluded that surgeons tend to underestimate their influence on medical students entering surgery. Similarly, in a multinational study of 8 countries with 841 respondents, final-year medical students (whether choosing surgery or not as a career) noted that presence of good role models is a strong factor to increase the interest in applying for general surgery residency.²⁵ The role of a surgeon teacher stretches far beyond the confines of an operating room or class room, and surgeons should be cognizant of the influence they hold on medical students.

Highlight lifestyle issues

For an average medical student in his or her twenties, it can be a daunting task to make a career choice that will affect one's professional life for the next 3 to 4 decades. It is quite common for medical students to see the tree but miss the forest by confusing the lifestyle during residency with lifestyle in practice. The onus is on the surgical community to highlight to potential students interested in surgery that lifestyle during residency does not uniformly translate to the lifestyle in practice. In addition, one should emphasize that residency stretches across a finite period of time (usually 5 years or more if taking time off for research), whereas practice as a surgeon is infinite until retirement. Students need to be appraised not to make decisions against a surgical career based on the lifestyle during the limited period of residency but to make decisions based on the multiple rewards of a surgical career after training. It should

also be pointed out to the students that although surgical careers can be stressful due to the nature of the work involved, the rewards are commensurate with the stress involved.

Small-group discussions directed by surgeons to discuss lifestyle after training can be helpful. Some of the earlier studies noted a higher divorce rate among surgeons when compared to other specialties.²⁶ The more recent studies have noted that physicians in general lead stable lives. Ly and colleagues²⁷ performed a retrospective analysis of the divorce rates in various professions by using the US census data from 2008 to 2013 and noted that physicians had a lower divorce rate when compared with other professions (Table 7). Female physicians had a higher divorce rate than their male counterparts. Although this study did not analyze divorce rates based on specialty, the overall probability of ever being divorced is lower for physicians when compared with other professions. Similarly, Harms and colleagues²⁸ conducted a 25-year single-institution analysis of the fate of general surgeons and noted a divorce rate of 21.4%, which is similar to the rate from Ly and colleagues²⁷ for physicians and lower than for other professions. The onus is on the surgical community to educate medical students that surgeons in practice can lead meaningful and happy lives.

Strategic targeting of residents

With regards to pursuing a surgical career, medical students can be categorized into 3 groups. There is a small group of students who are firmly determined that they will pursue a surgical career, and nothing will dissuade them from following on their career aspirations. Many more students are equally firm that they will not pursue surgery regardless of what is offered or presented to them. In between these 2 groups is a group that is undecided and can be influenced to pursue a surgical career. While ensuring that all students receive sufficient education, it might behoove the surgical community to spend some extra effort on the undecided group by providing positive experiences during surgical clerkship to steer them toward a surgical career.

International medical graduates

The drop in interest amongst US seniors^{16,17} toward general surgery has led to general surgery residency positions that are increasingly filled by international medical graduates (IMGs) and graduates from other diverse pathways. The role of IMGs in surgery in the United States continues to evolve with the supply–demand cycles. IMGs serve a role on several fronts to augment the surgical workforce in the United States. This includes filling the preliminary positions and accepting jobs in underserved areas.

Table 7	
Divorce rate in various professions: probability of ever being divorced	
Profession	Divorce Rate in % (95% Confidence Interval)
Physicians	24.3 (23.8–24.8)
Dentists	25.2 (24.1–26.3)
Pharmacists	22.9 (22.0–23.8)
Nurses	33.0 (32.6–33.3)
Health care executives	30.9 (30.1–31.8)
Lawyers	26.9 (26.4–27.4)
Nonhealth care professionals	35 (34.9–35.1)

Non-US senior applicants into general surgery residency come from diverse sociocultural backgrounds, which can have a bearing on the surgical workforce of the future. A proactive approach needs to be developed on how to integrate the IMGs to the benefit of the surgical workforce in the United States as well as the applicants who arrive on these shores for various reasons.

The surgical community has done an enormous amount of work to keep the pipelines patent for feeding bright medical students into surgical residencies. Despite all these efforts, there have not been any significant increases in the rate of US seniors applying to general surgery residency. While all the previously described measures may be of some use, members of the surgical community need to think radically out of the box to generate ideas that will entice more US seniors to apply to general surgery. What certainly will not work is nostalgia for the days of “this is how it was in our day.” Not only are medical students tired of this, but so are many surgeons. “This is how it was done in our day, and this is how good we were in the past” is not a justification to repeat the errors of the past. The constant theme of how surgeons were so good in the past and how the present students and residents are so bad is definitely not going to attract anyone anymore to surgery. It is highly inappropriate to state that a whole generation of current students are not worthy to be trained as surgeons. It is equally inappropriate to expect utopian, all metric-based perfection in trainees when current surgeons are less than perfect and practice in a world that is equally imperfect. Instead one should learn from the best of the past, avoid the errors of the past, and get acquainted with the millennial and postmillennial generations to identify those talented medical students who will become the surgeons of future. Intelligence and industry are definitely not in dearth in these bright young men and women, but what is needed is the ability to channel that talent respectfully in the right direction to maintain the ranks of surgery.

Surgical Residency

The primary theme at this stage is to encourage more general surgery residents to practice general surgery.

Change perceptions about general surgery

It is not uncommon for general surgery residents in training to say that they want to pursue “just” general surgery. This gives the impression that pursuing general surgery as a career right after training is in some ways inferior or less gratifying than to pursuing a fellowship after completion of residency. The surgical graduate medical education (GME) community needs to encourage those residents who want to enter practice after completion of residency by providing guidance and outlining the rewards of such a career choice.

General surgery is a high-priority specialty

The 21st report²⁹ published by the Council on Graduate Medical Education (COGME) in August 2013 is titled as: “Improving value in Graduate Medical Education.”¹ The report emphasizes the need for obtaining greater value for public funds allocated to GME by redirecting funds to certain high-priority specialties. These high-priority specialties were identified based on several factors including the need for these services in the future. General surgery is 1 of the 6 high-priority specialties identified by COGME for increases in GME funding. The importance of general surgery is being recognized at the federal level and state level, and by elected officials. It would be appropriate to highlight this to surgical residents planning to pursue general surgery so as to enable them to feel satisfied with their career path.

Appraisal of location of surgery residency programs

There were 257 general surgery residency programs included in the match process for 2015, with 1224 available categorical general surgery residency positions.³⁰ A review of the geographic location of the residency programs reveals significant variability in the number of general surgery residency programs per state (Table 8). There are certain states with more than 20 general surgery residency programs, whereas there are some states that have none. This variability could be a reflection of the state’s population, which drives the need for surgical services. At the same time, presence of fewer programs or none in some states could explain the difficulty in attracting general surgeons to practice in those states. This could contribute to the uneven distribution of general surgeons across the United States.⁵ Attempts should be made to support new programs or expand existing programs in states with low numbers of surgeons to address the lopsided distribution of general surgical workforce across the nation. Similarly, introduction of rural tracks during residency is likely to increase the number of graduates settling in rural areas and practicing general surgery.

Tackling duty hour regulations

The debate on the pros and cons of the duty hour regulations³¹ has been vigorous from its inception and is likely to continue unabated. In the interim, several studies have been published about the pros and cons on the effects of the duty hour rules on resident education and patient care. For the purposes of this article, one study published by Philibert and colleagues³² will be referred to. This study, published in 2013 by the leadership of ACGME, was an attempt to determine the effect of the duty hour rules on resident education, patient safety, and other metrics. Of the 7 studies that reported worse patient safety outcomes, 5 of them included surgical specialties. The duty hour regulations were introduced without any evidence to suggest benefits to resident education or patient care. It is hoped that this question will be answered in the near future by the FIRST (Flexibility In duty hour Requirements for Surgical Training) trial,³³ which was initiated in July 2014; the interim results are eagerly anticipated. In the interim, the surgical community should continue to refine training methods within the confines of restricted duty hours, which in some form are likely to be permanent. This will ensure that surgeons of competence who feel comfortable to go out into practice without feeling the need to pursue additional fellowship training are trained.

Gender-friendly environment in surgical residency

Nearly 47% of students in medical schools across the United States are women, and they also constitute 46% of the resident community.³⁴ Female surgeons account for

Table 8 Number of general surgery residency programs per state			
Number of General Surgery Residency Programs per State			
High Number of Programs per State		Low Number of Programs per State	
New York	26	Kansas	2
Pennsylvania	20	Oklahoma	2
California	18	Nebraska	2
Ohio	14	North Dakota	1
Texas	14	South Dakota	0
Michigan	12	Wyoming	0

15.4% of the general surgery workforce, and they constitute a larger fraction (32%) of the number of residents in general surgical residency programs.⁴ The number of women seeking a career in general surgery is likely to increase to mirror the increasing number of female medical students. Surgical leadership should ensure that the environment is conducive to address issues specific to female surgical residents, such as the ability to take maternity leave without adverse consequences. Although professional growth is expected during residency, no one would hope that it comes at the expense of stifling personal growth. The extended leave option and the 6-year option put forth by the American Board of Surgery (ABS) are laudable steps in that direction.³⁵ Despite these measures, female residents still tend to deliver the news of their pregnancy to the program director with cautious trepidation instead of sharing the news with boundless joy. Further measures such as those instituted by the ABS can entice more female students to apply to general surgery and contribute to the workforce.

Progression during residency based on assessment and testing in written, oral, and technical skills after graduation

The current system assures progression through residency without any testing unless there are serious deficiencies. Although a return to pyramidal system is unwarranted, the ability to test competency in all domains before progression to the next year will ensure that training surgeons of competence are trained. Similarly, the technical skills of graduates are not currently tested. Greater assimilation of simulation will provide the opportunities to test surgical skills. Testing proficiency, not only in written and oral skills, but also technical skills, will ensure that graduates are confident to enter the practice of general surgery without pursuing additional fellowship training.

Shorter training period/absorb training practices from other parts of the world

The 5 year period for training general surgeons in the United States is considered sacrosanct. While the surgical community is accustomed to the 5-year period, there is no evidence to suggest that this is the appropriate period to train general surgeons of competence. It is likely that more time is needed or just as likely that general surgeons could be trained in shorter periods of time. Such a debate would cause much consternation, particularly in the environment of restricted duty hours, which many feel has already compromised general surgical training.

There are several rotations that are currently part of the general surgery residency training curriculum that contribute minimally to the practice of the current general surgeon. This trend may continue to increase as more specialties become highly specialized. Is it possible to envision the general surgeon of the future whose scope of practice consists of treating only the most common general surgical conditions and refer others to the specialists? Is it possible to train the general surgeon of the future who is competent in addressing the most common general surgical conditions only with minimal exposure to other surgical conditions? If such is the case, is it possible that the general surgeon of the future can be trained in a shorter period of time? A shorter training cycle will also provide the malleability needed to address workforce shortages rapidly.

Surgical training systems across the world are of varying duration. It would be beneficial to explore these various systems to provide the stimulus to develop surgical residency programs of shorter or longer duration. The training system in the United States is considered by many to be the model for surgical training. Before one discounts other training systems, however, it would be prudent to recall that Halsted pioneered the residency system based on his observations while traveling abroad.

System should be rapidly adaptable to new diseases and technology

The content of surgical residency training should reflect the patterns of surgical diseases and also the adoption of new technology. One should be nimble to be able to take emphasis away from pathologies such as peptic ulcer disease and be able to focus it on newer procedures such as bariatric surgery. Similarly, one also should be able to assimilate training in newer technologies in a rapid fashion, which can be aided by simulation-based training. Training in new technologies during residency itself will decrease the need for pursuing additional fellowship training just to acquire skills in procedures based on new technology.

Promote global health rotations

The current generation of medical students is passionate about global health.³⁶ Unless avenues to undertake global health rotations are provided, bright students may choose other specialties that are more open to such opportunities. Residents who undertake such rotations could also be more likely to provide care in underserved areas, which can help address the uneven distribution of surgeons.

Target attrition

It is beyond the scope of this article to review the causes behind attrition during residency.³⁷ This multifactorial issues need to be tackled so that bright residents can be retained to complete their training and join the surgical workforce.

Lobbying to increase the number of residency positions

The "Training Tomorrow's Doctors Today Act" bill³⁸ was introduced in 2013 to support 15,000 new residency positions over a 5 year period. It is unlikely that this bill will come to fruition, but the surgical community should continue to lobby to increase the number of residency positions to boost the ranks of the surgical workforce.

In summary, the surgical training system in the United States pioneered by Halsted is considered to be one of the best in the world and has served as a durable model for the United States and many other countries in the world. Although this model has stood the test of time, the health care system in the United States has witnessed significant changes in the recent times. These changes will have a significant bearing on how the future generation of general surgeons is trained, which in turn will have a profound influence on the surgical workforce. Complacency cannot be the order of the day. The surgical community needs to be proactive in initiating/embracing the changes and instituting innovative practices to the surgical training paradigm. This will require radical thinking, which might well go against the conventional wisdom. But unless the approach involves such radical ideas based on the principles of creative destruction, one runs the risk of becoming irrelevant or control of training future surgeons might be ceded to other entities. The history of the field of surgery is punctuated by surgeons who have demonstrated great leadership and made significant contributions to the entire field of graduate medical education. The Halstedian model was indeed pioneered by a surgeon. The time is ripe again for the surgical community to rise to the challenge and modify/develop new surgical training paradigms that can serve as seminal models of graduate medical education. It is hoped that these models will serve the nation just as admirably well as the Halstedian model did in training generations of physicians and surgeons for well over a century.

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