
International Medical Graduates in General Surgery: Increasing Needs, Decreasing Numbers

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- BACKGROUND:** The current residency training system in the United States (US) has inherent dependence on the international medical graduate (IMG). This article discusses the physician workforce shortage, especially related to general surgery, and examines the distribution of IMGs in general surgery ranks.
- STUDY DESIGN:** We performed a cross-sectional study using the American Medical Association Masterfile database of physicians licensed to practice in at least 1 state and determined the number and location of general surgeons in practice. We then stratified the distribution of these practicing surgeons, both IMGs and non-IMGs, according to rural urban commuting areas into small rural, large rural, or urban areas.
- RESULTS:** There were 17,727 general surgeons. IMGs were older (52 ± 8 years versus 47 ± 8 years; $p < 0.001$), more likely to be male (93% versus 82%; $p < 0.001$), and more likely to be further out of training (46% versus 28% ≥ 20 years out of training; $p < 0.001$). There were 2,216 IMGs in urban cores, constituting 15% of general surgeons in these areas. Large rural areas contained 223 IMGs (12% of general surgeons in these cores) and small rural areas contained 163 IMG general surgeons (16% of total general surgeons in these cores).
- CONCLUSIONS:** General surgeons are in high demand, and until now have remained inherently dependent on IMGs to reinforce their ranks. Current numbers of IMGs in practice are declining. This decline, coupled with inadequate numbers of trainees in domestic general surgery programs, creates a crisis of urgency. (J Am Coll Surg 2010;210:990–996. © 2010 by the American College of Surgeons)
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Many physicians and seasoned medical educators are surprised when they hear that the current United States (US) paradigm for residency positions is designed with an inherent dependence on international medical graduates (IMGs) to fill the ranks. In the National Resident Matching Program's 2009 Main Residency Match, there were 22,427 total positions in all specialties offered at a PGY1 level; yet, only 15,638 students enrolled in US allopathic medical schools submitted rank lists for those positions.¹ Even if every US allopathic senior student from 2009 who submitted a rank list had matched to a 1st-year position, only 70% of available positions would have been filled.

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Also active in the 2009 Match were an additional 1,222 previous-year graduates of US allopathic medical schools, 2,015 students/graduates of osteopathic medical schools, 106 graduates of the soon-to-be-obsolete Fifth Pathway program (additional training in a US medical school after graduation from an international school), and 35 Canadian graduates.¹ Even if all of those additional applicants from the US system had matched, only 84.8% of the positions would have been filled.

Naturally, this deficit is filled then by IMGs, a group frequently maligned by the perception of a substandard education, poor communication skills, and essentially "robbing" homegrown graduates of their jobs. IMGs are defined as graduates of medical schools located outside the United States and Canada and include both US citizens and noncitizens who have trained abroad. The Educational Commission for Foreign Medical Graduates requires IMGs to complete 4 years of education at a medical school listed in the International Medical Education Directory and to obtain passing scores on the same licensing examinations as US graduates.

General surgery has traditionally trained proportionately fewer IMGs compared with specialties such as inter-

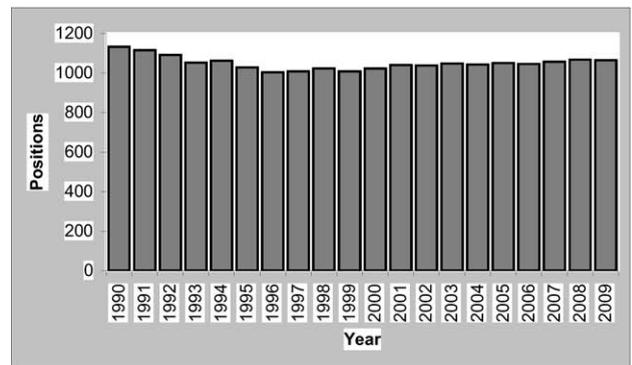
nal medicine and family medicine. This might be secondary to the relative number of positions offered by each of the respective specialties. There were 1,065 positions offered through the National Resident Matching Program in categorical general surgery in 2009, compared with 4,922 in internal medicine (excluding combined specialty programs), and 2,535 in family medicine.¹ Over time, the total number of general surgery training positions available has remained relatively constant, even decreasing slightly during the past 2 decades. Internal medicine shows a similar consistency, and family medicine shows fluctuation but an overall net increase in positions (Fig. 1).²

This article reviews shortages predicted in the physician workforce (particularly general surgery); briefly reviews current policy under consideration aimed at addressing those shortages; describes the distribution of IMGs in surgical training; and examines data obtained from the American Medical Association Physician Masterfile showing the distribution of IMGs in general surgery in urban and rural communities of the United States. With a population of physicians that is not projected to meet increased health care needs, we are still dependent on IMGs to meet current numbers of total first-year training positions. Additionally, if we expand the number of first-year training positions to meet patient needs without substantially increasing the number of domestic applicants, our immediate dependence on IMGs in this field will only increase. In the face of a current shortage of general surgeons and evidence of decreasing numbers of surgeons in areas where we have the greatest deficit, ie, small rural areas, we will be forced to welcome and adapt to training more IMGs in the future to meet our needs as we concentrate on ways to increase our production of domestic graduates.

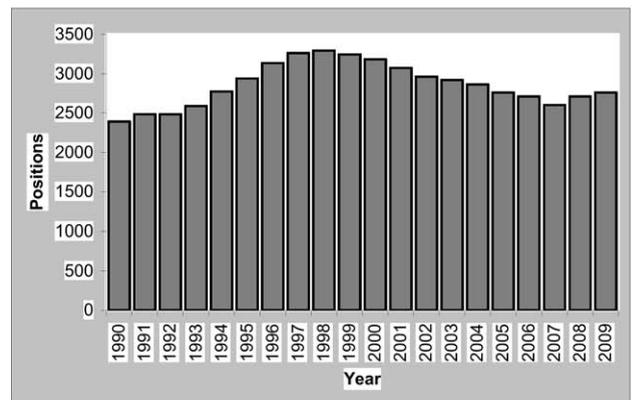
Shortages of physicians and general surgeons

During the past century, predictions of the number of physicians needed to meet the demand for health care services have vacillated between surplus and deficit. Resultant policy changes have led to substantial decreases and then increases in medical school enrollments and to increases in the numbers of physician extenders in the workforce. The most recent action occurred 12 years ago—with predictions of a physician surplus looming, the Balanced Budget Act of 1997 froze funding for residency positions at the 1996 levels.³ We now find ourselves facing a physician shortage predicted to be as great as 200,000 in 2020,⁴ with specific shortages of general surgeons around 1,875 and an inability to immediately increase our physician supply.⁵

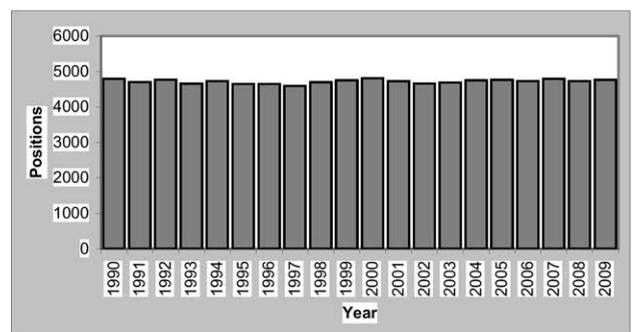
Although some incentives have encouraged enrollment in primary care specialties, general surgery has not benefited from those incentives to date. The Council on Graduate Medical Education noted in its third report in 1992 that growth in surgical services is likely to expand beyond



A



B



C

Figure 1. Number of (A) categorical general surgery, (B) family medicine, and (C) internal medicine (excluding combined specialty programs) positions offered each year in the Match since 1990.²

the capacity of the number of general surgeons trained, and that both family physicians and general surgeons are the most likely specialties to serve rural populations.⁶ However, generalist physicians were then defined as “family physicians, general internists, pediatricians, physicians trained in combined internal medicine and pediatrics programs, and general practitioners,” a definition that has changed very little in the last decade.^{7,8} General surgery often has not been included in workforce discussions and position in-

creases. Yet rural hospitals bear the surgical workforce shortage and a paucity of general surgeons is perceived as a major threat to their existence.^{9,10}

What is a general surgeon?

Part of the difficulty in addressing shortages in general surgery is in the definition of a general surgeon. Skills taught in a general surgery residency serve as fundamental training for surgical subspecialties including colorectal, transplant, thoracic, pediatric, and others. Trainees in general surgery will not necessarily practice general surgery after training, and the number of general surgery residency positions filled for PGY1 does not directly result in the number of general surgeons produced at the end of 5 years.

Also, the proportion of general surgery residents who chose to pursue fellowship training rose from 67% to 77% in the interval from 1993 to 2005.¹¹ This increase in specialization has negative workforce implications on general surgery if residents who pursue fellowships are less likely to practice as general surgeons, or training is prolonged by an additional 1 to 3 years. Both negate needed contributions to the workforce by general surgeons.

For the purposes of this article, the definitions of Jonasson and colleagues,¹² Thompson and colleagues,¹³ and Lynge and colleagues¹⁴ were used to capture those surgeons in the workforce who primarily supply true “generalist” surgical services. A study published by Lynge and colleagues in 2008 showed that there were 7.68 general surgeons per 100,000 in 1981 compared with 5.69 per 100,000 in 2005.¹⁴ The reason for the decline can be explained by substantial population increases without concomitant increases in training positions. The total US population in 2000 was 282 million and is projected to be 335 million in 2020.¹⁵ Given population projections in the future, this mismatch between supply and demand would continue.

Other factors that contribute to increasing demand include increasing longevity of the US population. The proportion of people older than 65 years of age is projected to increase from 12.4% in 2000 to an estimated 16.3% in 2020—individuals who are expected to use health care at a greater rate than their younger counterparts.¹⁵ Despite increases in the patient population, the number of general surgery trainees has remained remarkably constant, increasing by only 1.3% (14 positions) in the past 5 years,¹ with an overall decline in the past 20 years.² In the 2009 Main Residency Match, 1,079 US allopathic seniors and 992 independent applicants (any applicant not a US senior) ranked the 1,065 general surgery positions offered in the Match and only 5 of those positions were unfilled at the time of the Match.¹

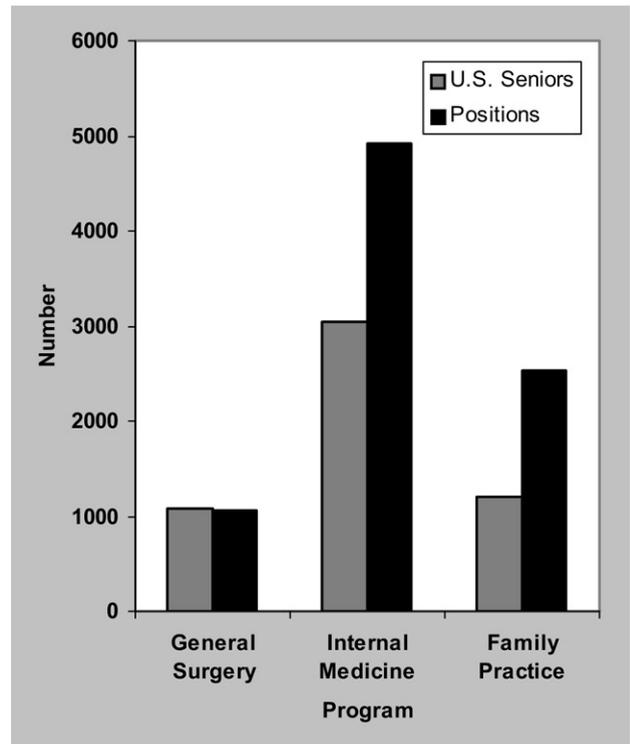


Figure 2. Number of US allopathic senior applicants and total number of positions in categorical general surgery, categorical internal medicine (excluding combined specialty programs), and family practice. 2009 Match.¹

General surgery training programs and IMGs

The National Resident Matching Program recently published data showing that in the 2009 Match there were 1.43 residency positions per active US allopathic senior student and 0.75 positions per all active applicants.¹ Match rates varied considerably by applicant type, with 93.1% of US allopathic seniors matched to a first-year position compared with 47.8% of US IMGs and 41.6% of non-US IMGs.¹ Slightly more US seniors ($n = 1,079$) ranked general surgery programs than available positions ($n = 1,065$). In other fields, such as internal medicine and family medicine, the numbers are strikingly different, with US seniors making up only a fraction of the applicants. For example, there were only 3,385 US seniors submitting rank lists for 5,592 categorical internal medicine positions (of which 674 are combined specialty programs, such as medicine-pediatrics or medicine-emergency medicine). Only 1,195 US seniors submitted rank lists for 2,535 family medicine positions¹ (Fig. 2). Comparatively, general surgery has, to date, been relatively immune to an influx of IMGs (who typically garner spots unfilled by US graduates) with 11.8% of the general surgery positions filled by IMGs in the 2009 Match, compared with 36.7% IMGs in categor-

ical internal medicine positions and 35.6% in family medicine.¹

The composition of the entering general surgery class might soon change. The Resident Physician Shortage Reduction Act of 2009 has been introduced in the US Senate and House of Representatives,^{16,17} reflecting a proposed increase of 15% to the total number of residency slots, totaling around 15,000 positions, with preference given to primary care and general surgery. Also, the Physician Workforce Enhancement Act of 2009 has been introduced in the House and is intended to provide loan services to eligible hospitals to establish residency training programs.¹⁸ Preference would be given to rural and small urban areas and programs would be limited to particular specialties, including family medicine, internal medicine, general surgery, and others.¹⁸ Each of these measures could help increase the workforce but would place an immediate increased dependence on IMGs in general surgery residencies.

This dependence might be aggravated by declining interest in general surgery by US seniors. For example, although there has been a substantial increase in total US seniors submitting rank lists in the 2009 Match compared with 2005 (net increase of 919 US seniors), the number submitting rank lists for general surgery during the same time period has actually decreased by 72 applicants.^{1,19}

METHODS

In an attempt to understand the distribution of IMGs in the general surgery workforce, we examined the American Medical Association Masterfile. This comprehensive physician database contains information on both allopathic and osteopathic physicians who are licensed in at least 1 state. IMG surgery data from the American Medical Association Masterfile were retrieved in late December 2008, and US data were obtained 3 months later in early March 2009 (from Medical Marketing Service, Inc.). The term *active nonresident surgeon*, as described by Lynge and colleagues¹⁴ and Thompson and colleagues,¹³ was used to track and compare trends.

General surgeons were defined as those who listed their primary specialty as general surgery, abdominal surgery, trauma surgery, or critical care. To classify only those thought to be actively contributing to the workforce, inclusion criteria were limited to those who reported their major professional activity to be office-based practice, hospital staff, or locum tenens. Surgical residents were excluded. In addition, those older than the average age of retirement (62 years)²⁰ were excluded. It is known that the average age of retirement can fluctuate with economic conditions. Demographic characteristics of all surgeons meeting the inclusion criteria were compared by univariate anal-

Table 1. Demographic Characteristics of Practicing General Surgeons, Comparing Graduates of US and Canadian Medical Schools with International Medical Graduates

	Non-IMG (n = 15,120)	IMG (n = 2,607)	p Value
Age (y), mean \pm SD	47 \pm 8	52 \pm 8	<0.001
Male, n (%)	12,450 (82)	2,431 (93)	<0.001
Foreign-born, n (%)*	1,610 (11)	1,797 (83)	<0.001
Years out of training, n (%) [†]			<0.001
<10	4,953 (34)	730 (29)	
10–19	5,576 (38)	623 (25)	
\geq 20	4,194 (28)	1,168 (46)	

*Total 14,673 non-IMG and 2,171 IMG physicians.

[†]Total 14,723 non-IMG and 2,521 IMG physicians.

IMG, international medical graduate.

ysis according to age, years after training (<10, 10 to 19, \geq 20 years), birthplace (United States or not United States), and gender.

Location of practice was examined for both IMGs and US graduates in the general surgery workforce. Rural urban commuting areas (RUCAs)²¹ were used to classify practice location as urban, large rural, or small rural, and ZIP codes obtained from the American Medical Association Masterfile were coded as work addresses of the surgeons. RUCAs use commuting patterns and census-based population data to determine areas in proximity to larger communities. For the purposes of this study, RUCAs were grouped into 3 larger categories according to the core population central to each ZIP code as follows: urban (metropolitan core population >50,000); large rural (core between 10,000 and 50,000); and small rural (core population <10,000). ZIP codes that localized the physician to Guam, the Virgin Islands, or Puerto Rico were excluded and the remaining ZIP codes were matched to the ZIP code version of the RUCAs, 2006.²¹

RESULTS

Using these criteria, there were 17,727 general surgeons. US graduates and IMGs had the following characteristics: IMGs were older (52 \pm 8 years versus 47 \pm 8 years; p < 0.001), more likely to be male (93% versus 82%; p < 0.001), and more likely to be further out of training (46% versus 28% \geq 20 years out of training; p < 0.001) than their US graduate counterparts (Table 1). As expected, 83% of IMGs were foreign-born, but 11% of domestic graduates were also foreign-born (p < 0.001).

There were 2,216 IMGs in urban cores, constituting 15.1% of general surgeons in these areas. Large rural areas contained 223 IMGs (11.6% of total general surgeons in these cores) and small rural areas contained 163 IMG gen-

Table 2. Distribution of Practicing General Surgeons among Urban and Rural Communities

RUCA classification	Non-IMGs (n = 15,043)		IMGs (n = 2,602)		p Value
	n	%	n	%	
Urban	12,505	83	2,216	85	<0.001
Large rural	1,703	11	223	9	
Small rural	835	6	163	6	

IMG, International medical graduate; RUCA, rural urban commuting area.

eral surgeons (16.3% of total general surgeons in these cores) (Table 2). In addition, IMGs in small rural areas were slightly older, more likely to be male, and tended to be further out of training than IMGs in other areas (Table 3).

DISCUSSION

General surgeons are in high demand, particularly in small rural areas. Reflective of the consistent number of general surgery trainees, the total number of general surgeons during the past 2 or 3 decades has not changed substantially. By these criteria, there were 17,394 general surgeons in 1981, 17,775 in 1991, 17,922 in 2001, 16,662 in 2005,¹⁴ and 17,727 in this study. We are currently dependent on IMGs to reinforce our ranks as both residents and active surgeons in the workforce. The current proportions of IMGs in the small rural areas and their demographic composition as reported in this and other studies suggest that we might be losing IMGs to either retirement or more urban settings, contributing to our workforce crisis.

A survey of general surgery trainees during the American Board of Surgery In-Training Examination suggested that the proportion of IMG chief residents had almost tripled between 1993 and 2005 (from 7% to 19%).¹¹ However, during this period, the number of categorical residency positions and the number of general surgeons remained relatively constant (Fig. 1).² This suggests that IMGs who are training in our domestic programs are either entering fellowships and not practicing as general surgeons, or returning to their home countries to practice. Neither of these prospects is advantageous to our workforce shortage of general surgeons.

The proportion of IMGs practicing in small rural areas appears to be decreasing. While IMGs constituted 17.4% of general surgeons in 2005,¹⁴ they represented only 14.8% of surgeons in our study. This reduction is further demonstrated in rural areas by Lynge and colleagues, who showed that IMGs once represented 25.3% of rural surgeons in 1981, 26.5% in 1991, 18.1% in 2001, and only 14.9% in 2005.¹⁴ IMGs constitute a smaller proportion of general surgeons in small rural practices, areas that experience the greatest impact of general surgery shortages. This reduction

Table 3. Demographic Characteristics of International Medical Graduate General Surgeons Practicing in Urban and Rural Communities

	Urban and large rural (n = 2,439)	Small rural only (n = 163)	p Value
Age (y), mean ± SD	52 ± 8	53 ± 9	0.011
Male, n (%)	2,267 (93)	160 (98)	0.006
Foreign born, n (%)*	1,680 (83)	114 (80)	0.413
Years out of training, n (%) [†]			0.070
<10	690 (29)	37 (23)	
10–19	588 (25)	35 (22)	
≥20	1,078 (46)	88 (55)	

*Total 2,205 urban and large rural physicians and 142 small rural physicians.

[†]Total 2,356 urban and large rural physicians and 160 small rural physicians.

would be expected and not alarming if the total number of general surgeons in these small rural areas were increasing commensurately during the same time frame; instead the overall number of surgeons in those communities has been decreasing (1,636 surgeons in 2005¹³ and 998 surgeons in our study).

Current attempts to reconcile the discrepancy between supply and demand in general surgeons are inadequate. The current training model falls short in meeting the demands of a continuously growing and aging population. The Resident Physician Shortage Reduction Act of 2009 and the Physician Workforce Enhancement Act,^{16,17} are attempts at increasing the number of residency positions. This increase, although delayed, might potentially augment the ranks of general surgery. However, the rapid increase in the number of resident positions relies on availability of appropriate training programs.

Restrictions on resident work hours to 80 hours per week would predict a required workforce increase by ≥30% to meet the same work output. Hospital admissions and operative volume have increased nationally, particularly in tertiary centers. With increased demand, we should be able to provide an educational experience for additional residents in general surgery. However, we must confront the fact that, with current applicant trends and legislative delays, these additional residents will likely be IMGs.

If independence from external trainees is a goal, our domestic supply of physicians in all “generalist” specialties must increase considerably. One hundred eight of the 126 existing medical schools (86%) are increasing class size, with a projected expansion of allopathic graduates by 5,000 each year by 2020.²² Also, 9 new osteopathic schools have been started since 2000.²² However, as mentioned here, the number of students opting to match in general surgery in recent years has not increased proportionately. Rather, there has been a net decrease. Additionally, production of

board-eligible or board-certified surgeons lags considerably behind an increase in medical school admissions, assuming 4 years for medical school education and ≥ 5 years for general surgery residency training. Until domestic production of general surgeons increases as a result of increasing class size, we remain dependent on IMGs. This model of dependence has already been used in our Veterans Affairs hospitals across the nation, where IMGs are recognized as the “safety net” of the American health care system.²³ The influx of IMGs would therefore raise certain concerns and particular barriers.

Potential barriers would be the political and bureaucratic issues that accompany hiring an international worker. Applications for visas require an increased amount of work on behalf of the residency program and visa approval is not necessarily in place at the same time as a position is available. Also, as visas require different levels of commitment and renewal, the time of worker eligibility is not guaranteed to coincide with the length of a residency program. Many IMGs encounter frank resistance as programs do not even consider their initial applications.

Additional concerns in our current political climate cannot even assure that a resident could reliably travel in and out of the country. This might jeopardize resident workforce, create resentment among fellow residents, and risk an individual's required training time. This could even lead to a social stigmatization of residency programs who accept many IMGs.

Finally, one must also consider that hiring IMGs contributes to the global “brain drain.” Filling our health care system shortages draws valuable resources away from other countries with substantial needs of their own. In an age of globalization, what is our ethical responsibility? The authors addressed this issue in a prior publication, calling for “partnerships” between the United States and other developed countries to integrate training by establishing international standards and curricula framework, while increasing enrollment in international medical schools in these countries.²⁴ However, this would take years to initiate and enact a delay that we cannot afford currently.

How is it that we have reached this point where our domestic supply is not yet to the point of meeting our nation's demand? A primary over-riding factor is that of regulation. This regulation spans the number of residency positions, the federal funding allowed for these positions, and the work hour regulations imposed. Each of these regulations, although established with job security and patient safety in mind, have not contributed to a free market stance that would allow supply to expand to meet demand.

We are now at a critical point where we cannot provide for our own citizens through our medical education sys-

tem. We must first acknowledge the important contributions that IMGs have provided to our current system, but we must also recognize that even their contribution is declining, particularly in the areas where we need them the most. Without the incoming supply of general surgeons to meet the population's demand and an ability to accept this potential influx, we face an accentuated crisis.

Author Contributions

Study conception and design: Terhune, Zaydfudim, Abumrad

Acquisition of data: Terhune

Analysis and interpretation of data: Terhune, Zaydfudim

Drafting of manuscript: Terhune, Zaydfudim, Abumrad

Critical revision: Terhune, Zaydfudim, Abumrad

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