The State of General Surgery Residency in the United States
Program Director Perspectives, 2001
Leigh A. Neumayer, MD; Amalia Cochran, MD; Spencer Melby, BS; Hugh M. Foy, MD; Marc K. Wallack, MD

Hypothesis: Current demographic patterns and lifestyle factors of general surgery residents may contribute to recent changes in recruitment patterns.

Design: Survey addressing the characteristics of general surgery residency, including demographic data, 3-year recruitment and retention trends, and working conditions of general surgery residents.

Participants: A convenience sample of all residency program directors in attendance at the 2001 Surgical Education Week was given the opportunity to voluntarily complete the survey.

Results: A total of 109 program directors responded to the survey. Women constitute 25% of all current general surgery residents: 66% of the program directors perceived a decline in the number of applicants for general surgery residency. Recruitment patterns differ significantly between small (≤4 categorical residents per year) and large (>4 categorical residents per year) residency programs. Residents at large programs averaged a 95-hour workweek, whereas those at small programs averaged an 88-hour workweek (P = .01). The mean 1-year attrition rate for general surgery residents was 20.2% in 2000, and attrition showed no relationship to program size, gender composition, or working conditions.

Conclusions: Women remain underrepresented in general surgery residency. Recruitment and match statistics show some variation, but the relevance of a shrinking applicant pool to these changes is unclear. Resident working conditions remain a difficult issue, and attrition rates continue to be significant. A substantial research agenda remains in graduate surgical education.

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GENERAL SURGERY residency has rapidly evolved from a highly competitive specialty choice to one plagued by recruitment and retention concerns. The effect of "controllable lifestyle" on medical student specialty selection is undeniable.1,2 Recent trends in the National Resident Matching Program match highlight the increased concern for lifestyle considerations by medical students; anesthesiology, pathology, and radiology have increased the number of residency positions offered and the percentage of these positions filled, whereas general surgery and family practice have filled fewer offered positions.3 Furthermore, spousal opinion affects specialty selection, with many spouses being unwilling to accept the lifestyle demands of general surgery residency.4 A complementary concern is the persistence of a substantial attrition rate among general surgery residents in the postpyramidal residency era. Documented attrition rates are 12% to 26% in various studies.5-7 Residents who voluntarily leave surgical training consistently cite time commitment or family demands as the basis for their departure.6,7 The same factors driving the diminishing student interest in surgical careers seem to be at work in the retention of general surgical residents as well.

Institutional pressures regarding educational experience, work hours, and time off are also beginning to play an important role in general surgery residency. The educational demands placed on general surgery residents increase dramatically with each new basic science discovery or technological advance. The Accreditation Council on Graduate Medical Education program requirements in general surgery have recently been extended to mandate 1 day in 7 free from clinical duties on average and that in-hospital calls be no more often than every third night. Further pressure to reduce work-hour requirements for general surgery residents...
is inherent in recent calls for 80-hour workweek limits for all residents. Surgical education thus faces the problem of expanding educational demands and less time for trainees to meet them.

This study describes the present environment of general surgery residency in the United States. Areas investigated include demographic characteristics of general surgery residents, 3-year recruitment and retention trends in general surgery residency programs, and working conditions of general surgery residents. An associated goal of this study is to elucidate patterns within any of these areas that merit further investigation.

**METHODS**

**SURVEY**

We designed a survey to address the overall characteristics of general surgery residency. The number of categorical positions offered, the rank positions of the first- and last-matched candidates, and the number of applicant interviews at each program for the past 3 years were recorded. Program directors described the quantity and quality of applicants overall and the quantity of female applicants as increasing, decreasing, or without change for the same period. We documented the total number of categorical residents at each responding program and the number of male and female residents, the number of married male and female residents, and the number of male and female residents with children. Working condition data included number of hours worked per week, number of days on call per month, and number of days off per month. Attrition was the number of residents who had left before completing training during the past year and during the past 5 years. Program directors then evaluated workforce solutions based on whether they had used them, proposed them, favored them, and believed they were likely to achieve success. These solutions included changes in the number of years of training, increasing the number of international medical graduates in surgical residencies, use of nurse practitioners or physician assistants as physician extenders, job sharing for residents, and use of a night float system. Finally, program directors documented their own work schedule, their career satisfaction, and the number of years they had been in their current position of program director.

Participants in the 2001 Surgical Education Week served as a convenience sample. All residency program directors in attendance at this combined meeting of the Association for Surgical Education and the Association of Program Directors in Surgery had an opportunity to complete a survey, and they were encouraged to do so at several meeting sessions.

**STATISTICAL ANALYSIS**

Most information about program directors was evaluated using descriptive statistics. Career satisfaction was designated on a 5-point Likert scale (1 indicated “extremely dissatisfied” and 5 indicated “extremely satisfied”). Equal intervals were assumed, and an average value of 3 was consistent with the null hypothesis. Demographic data and attrition information were also evaluated using descriptive statistics. A Pearson correlation coefficient was calculated between attrition and program size and between attrition and percentage of female residents. Program size was defined as small (offering ≤4 categorical positions per year) or large (offering >4 categorical positions per year).

Descriptive statistics were initially used to characterize the recruitment and match data and the working condition information. We subsequently used 1-way analysis of variance to evaluate all recruitment and match data and working condition data using program size as a fixed factor. Potential solutions to workforce and work-hour issues were also evaluated using descriptive statistics. The likelihood of an intervention achieving success was ranked by program directors on a Likert scale with the assumption that the categories represented an equal-interval scale from 1 to 5, with 1 representing “strongly disagree” and 5 representing “strongly agree.” The null hypothesis was an average response of 3. A 1-sample t test was performed for the responses to each question.

All data were analyzed using statistical software (JMP 4.0.0; SAS Institute Inc, Cary, NC). The Human Subjects Office at the University of Utah Health Sciences Center granted an institutional review board exemption.

A total of 109 program directors responded to the survey, representing 48% of the 226 general surgery programs in the United States. Program directors reported working an average of 68 hours per week and being on call an average of 8.3 nights per month. Program directors indicated that they spend an average of 7.5 hours per week teaching medical students and 26.2 hours per week teaching residents. The average time in the current position was 6.2 years (range, 1-26 years). Program directors tend to be satisfied with their careers, although the results of this question did not achieve statistical significance (mean Likert scale value, 3.2; P = .06).

Program directors reported that 25% of surgical residents were women, with individual programs ranging in resident gender composition from 0% to 53% women. Most male surgical residents were married, and one-third fewer female residents than male residents were married (38% vs 57%). Male residents were more than 3 times more likely than female residents to have children (33% vs 10%). Only 2% of all female surgical residents had a child during their training in the past 5 years.

Recruitment of residents shows somewhat different patterns between small and large residency programs for the 1999-2001 period (Table 1). The number of candidates interviewed and the number of interviews per categorical position varied significantly by program size. Large programs interviewed more candidates than did small programs during all 3 years, an expected finding. Small programs interviewed more candidates per position than did large programs. The number of candidates interviewed by both small and large programs declined from 1999 to 2001, and the number of interviews per categorical position also declined at both small and large programs.

We categorized by program size and compared the mean rank position for both high- and low-ranking matching candidates. Large and small programs were not significantly different in terms of the highest-ranked candidate matching to their programs, and these ranks did not vary significantly during the 3-year period. The last-matched candidates at large programs were ranked significantly lower than the last-matched candidates at small programs, another expected result. The last-matched candidates at large programs have been of progressively higher rank during the 3 examined years.
Of 98 program directors, 65 (66%) indicated that the number of applicants for surgical residency has declined, 14 (14%) indicated that the number of applicants has increased, and 18 (18%) were not sure. The number of female applicants was thought to be unchanged by 60% of responding program directors, but 28% of the respondents believed that the number of female applicants increased between 1999 and 2001. Regarding changes in applicant quality, the 99 program director responses were distributed equally among “increased,” “decreased,” and “not sure” (37%, 34%, and 29%, respectively).

Program directors described an average resident work schedule of 91 hours per week; residents at large programs (n = 24) were reported to work 95 hours per week, whereas those at smaller programs (n = 46) were depicted as working 88 hours per week (P = .01). The average number of days on call per month for all programs was 8.9, but residents at large programs (n = 33) took statistically significantly more on call days than those at small programs (n = 65) (9.5 vs 8.6 days; P = .03). The average number of days off for all residents was 4.0 days per month; residents at large programs (n = 32) tended to have slightly less time off vs those at smaller programs (n = 64), although this trend was not significant (3.6 vs 4.2 days; P = .24). Most program directors (63%) reported information about resident work schedule based on surveys of their house staff, with the balance estimating their house staff work schedule. Ninety percent of responding program directors believed that the reported data accurately reflected their residency program’s work schedule.

The mean 1-year attrition rate reported by program directors for 2000 was 20.2%. Five-year reported attrition was 14.7%. We found no correlation between attrition and program size, attrition and gender, or attrition and working conditions.

As far as solutions to workforce and work-hour concerns, use of physician extenders was the only measure with widespread use and acceptance (Table 2). Nearly half of the program directors reported using physician extenders, several had proposed their use, and many of the remaining program directors favored development of physician extenders as part of the surgical team. Most important, the use of physician extenders was viewed as likely to succeed. Using a night float or vacation coverage system, adopting job sharing, increasing international medical graduate opportunities, and changing the number of years of training were rarely used and were all viewed as having a poor likelihood of success.

Changes in societal expectations and medical education have placed general surgery training under a unique set of pressures. Demographic characteristics, recruitment and retention trends, and working conditions of general surgery residents all provide critical foundations for addressing the transformations being thrust on resident education. This survey elucidates several clear patterns in surgical training and provides the groundwork for future research on a variety of surgical education issues.

Important gender-related trends are evident in our results. Women remain underrepresented in surgical training vis-à-vis their enrollment in medical school, but the number of women in surgical residencies is far greater than the number of female surgical faculty members.8 Women seem to be making different sacrifices than their male coun-

<p>| Table 1. General Surgery Residency Recruitment and Match Results, 1999-2001* |
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<td>Total candidates interviewed</td>
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<td>32</td>
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*Data are given as numbers for large and small programs.

| Table 2. Solutions to Resident Working Condition Issues* |
|-----------------------------------------------|--------------|---------------|---------------|---------------|---------------|
| Solution                                      | Currently Used Solution | Proposed Solution for Use | Development of Solution Favored by Program Director | Mean Likelihood of Success† |
|-----------------------------------------------|---------------|----------------|----------------|----------------|---------------|
| Physician extenders (n = 65)                  | 54            | 9             | 27             | 3.76           |
| Night float or vacation coverage (n = 69)     | 6             | 3             | 18             | 2.41           |
| Job sharing (n = 62)                          | 1             | 1             | 13             | 1.74           |
| Increase IMGs (n = 66)                        | 5             | 3             | 9              | 1.71           |
| Decrease years of training (n = 68)           | 1             | 3             | 8              | 1.51           |
| Increase years of training (n = 66)           | 1             | 3             | 9              | 1.31           |

* IMG indicates international medical graduate.
†1 Indicates “poor”; 5, “great.” P < .001 for all solutions.

COMMENT

Changes in societal expectations and medical education have placed general surgery training under a unique set of pressures. Demographic characteristics, recruitment and retention trends, and working conditions of general surgery residents all provide critical foundations for addressing the transformations being thrust on resident education. This survey elucidates several clear patterns in surgical training and provides the groundwork for future research on a variety of surgical education issues.

Important gender-related trends are evident in our results. Women remain underrepresented in surgical training vis-à-vis their enrollment in medical school, but the number of women in surgical residencies is far greater than the number of female surgical faculty members.8 Women seem to be making different sacrifices than their male coun-
terparts in terms of marriage and childbearing during residency, as evidenced by the lower percentage of female residents who are married or have children. The potential for recruiting increasing numbers of women into general surgery and surgical subspecialties is unclear at this time, and family concerns may have a substantial effect. Women now constitute 45% of medical students, and gender-related deterrents to surgical careers must be addressed if we are to increase the recruitment of surgeons from this growing population of medical students.

This study demonstrates several trends in the recruitment and retention of surgical residents. The prevalent belief is that the number of applicants for general surgery residency is declining and that the perceived quality of these applicants varies widely. The program directors who participated in this survey were granting fewer interviews and filling their categorical positions without reaching as far into their rank lists. One interpretation of these changes is that the best and brightest candidates are still being aggressively recruited and highly ranked. However, it is also possible that the decreasing number of interviews and the higher rank of last-matched candidates is reflective of a shrinking pool of qualified candidates. The changes in application, interview, and ranking trends merit ongoing review.

The difference between working conditions for residents at small and large programs is of note. Residents at large programs are, on average, working 7 hours per week more than their counterparts at small residency programs, and they are on call slightly more days per month. Residents at large programs also tended to have fewer days off per month, although this result did not achieve statistical significance. An obvious potential shortcoming of the workload data is that some program directors were reporting from memory or by estimation. Nevertheless, most program directors believed that the numbers they provided were accurate, and more than half had ascertained this information by surveying their house staff. The difference in work schedules between small and large programs is not explained by our study and is an interesting avenue for future research.

Attrition by surgical residents remains a poorly defined problem. The 1-year and 5-year attrition rates in this study are consistent with those previously documented in the literature3-7; this lends credence to the validity of the data. Although workload is thought to contribute significantly to attrition, no correlation was present between any of our measures of working conditions and attrition rates. Program size and resident gender also seem unrelated to attrition rates. The decision to leave general surgery residency must be driven by a more complex set of factors than those elicited herein. Further investigation is needed regarding the motives of those who do not complete surgical training. Models describing characteristics of residents who leave residency programs would be of great interest to program directors and medical students.

Finally, use of present solutions to change house staff workload met with little confidence on the part of program directors. Physician extenders were the most widely used and the only positively received option. Night float has been the second most widely used option for workload modification, but it was generally seen as being likely to fail. Job sharing and increasing the number of international medical graduates were viewed as being unlikely to meet with success, and options for changing the number of years of required training were assessed even less optimistically. A significant paradigm shift will have to occur or different alternatives will need to be developed if house staff workload is to be modified.

General surgery residency is currently in an unparalleled state of transition. The confluence of the changing demographics of medical education, the changing priorities of those selecting careers as physicians, and the changing environment of graduate medical education has profoundly affected the current state of general surgery residency. Our study has provided a descriptive foundation for understanding the status of general surgery residency. A substantial research agenda still exists to define the decision making of female surgical residents in terms of marriage and childbearing. Attrition also remains an outstanding issue with a substantial avenue for investigation. Finally, resolution of work-hour issues is currently insufficient. Many aspects of general surgery residency remain in need of in-depth analysis if we are to understand and enhance the future of surgery education and the surgery profession.

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Corresponding author and reprints: Leigh A. Neumayer, MD, Department of Surgery, University of Utah Health Sciences Center, 30 North 1900 East, Room 3C410, Salt Lake City, UT 84132 (e-mail: leigh.neumayer@hsc.utah.edu).

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