Although projections of surgical workforce predict an increased need for general surgeons, especially in rural areas, graduates of residency programs increasingly enter urban or metropolitan specialty practice.

To determine whether fourth-year residents at a hospital in a rural setting were more likely to enter general surgery practice than a specialty.

In 2002, we initiated a year-long program for fourth-year residents. The records of all surgical residents (n = 70) who completed our general surgical residency and entered practice since the rural rotation began were divided into those completing the rural surgery program (rural) and those who did not (other). Demographic characteristics of the 2 groups and initial intent to practice rural general surgery were compared. Critical end points included completion of a fellowship, general surgery practice, and practice setting population of less than 50 000. As an additional control group, we compared these residents with those who completed residency just before our rural program began (1993-2002) with regard to fellowship and practice characteristics.

Age, sex, and initial practice plans.

Residents who completed the rural year were more likely to enter general surgery practice (10 of 11 [91%]) than those who did not (28 of 59 [47%]; P = .009). They were also more likely to practice in a site of population less than 50 000 (4 of 11 [36%] vs 4 of 59 [7%]; P = .02). The practice type and fellowship completion rate of the residents who finished all training years at Oregon Health and Science University during 1993-2002 and 2003-2012 did not differ. Most residents who completed the rural year (6 of 11 [55%]) entered residency with a desire to practice general surgery. Of the residents who entered training with a specialty career in mind, 4 of 5 (80%) who completed the rural year are practicing general surgery, while only 13 of 45 (29%) who stayed at our university program for the entire 5 years are in general surgery practice (P=.04).

Providing residents a dedicated and significant experience in a rural setting increases the likelihood that they will practice general surgery in a similar setting despite initial specialty plans. Implementing such programs might help alleviate the increasing gap in workforce needs of small towns and rural hospitals.

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For the past 2 decades, many forces have combined to threaten adequate access of rural citizens in the United States to timely surgical care. General surgeons in rural practice are aging and retiring. Inadequate numbers of replacements are entering the surgical workforce. Surgical residents increasingly choose not to become rural general surgeons but rather to specialize and remain in urban or metropolitan practice. Data from the American Board of Surgery indicate that almost 80% of finishing residents pursue fellowship training. If they remain in practice as general surgeons, they tend to seek practice in urban or metropolitan communities in hospitals in which their practice setting is similar to those in which they trained, with ready availability of specialists for consultation and to help care for problems for which their training in residency did not prepare them. These developments have already created a critical shortage of general surgeons in rural areas, a condition that will only worsen if corrective measures are not taken.

Although Oregon is the ninth largest state in geographic area, it is the 27th largest in population. Most of Oregon is sparsely populated, with many small, remote communities and 25 critical-access hospitals with 25 or fewer beds. People who reside in these areas most often cannot afford to travel long distances for routine medical or surgical care. Their communities can support a few primary health care providers and 1 or 2 general surgeons but not medical or surgical specialists. With a goal to educate surgeons with a desire to practice rural surgery and the expanded skill set to replace Oregon’s aging rural surgeons, the Department of Surgery at Oregon Health and Science University (OHSU) partnered with the surgeons at Three Rivers Community Hospital in Grants Pass, Oregon (population = 23,000) in 2002 to design a rural rotation that could be selected as an elective outside of the traditional 5-year general surgery residency track. The year-long rotation was of sufficient length that the resident could encounter a broad range of common conditions in general surgery and the surgical specialties. In addition, the residents and their families could become accustomed to life in a smaller community. The rotation was subsequently approved by the Residency Review Committee for Surgery as an added site for 2 residents to spend their fourth clinical year of residency.

After a decade of experience with this program, we wished to evaluate our initial hypothesis that residents who completed the year at Three Rivers Community Hospital would be more likely to enter general surgery practice in a rural or small-town community than the remaining residents in our general surgery residency program. A secondary objective was to compare the 2 groups with regard to whether they completed a specialty fellowship before entering practice.

### Methods

The records of all surgical residents who completed our general surgical residency and entered practice since the rural rotation began in 2002 were divided into those who completed the rural surgery year (rural) and those who did not (other). Demographic characteristics of the 2 groups (age and sex) were compared. The residency application files were examined to determine whether their initial career plan had been to practice general surgery or to further specialize after residency and what kind of practice type and locale they desired. Data for the 2 groups were compared using the Fisher exact test. Primary end points included completion of a fellowship, current practice of general surgery, and current practice serving a population of less than 50,000, the population above which the US Census Bureau designates as an urbanized area. We also compared the initial career plans of our 2 groups and whether these plans changed during residency.

As an additional control group, we examined the fellowship and eventual practice type of the residents who completed training in the decade just before our rural program began (1993-2002).

### Results

Of the 89 residents who completed the general surgery residency at OHSU since 2004, 70 entered surgical practice and were the subjects of this study. The 19 excluded are in fellowship (n = 15), in the military (n = 2), or not yet in practice after having just completed fellowship (n = 2).

The demographic data of the 70 who entered practice are listed in Table 1. The residents who did and did not complete the rural year did not differ in age or sex. All residents who entered the rural year completed the year there. The initial career goal of the groups was also not significantly different, although there was a trend for those in the rural group to favor a general surgical practice from the beginning of their residency. Although the initial goal of 5 of the 11 in the rural cohort was to specialize, only 1 actually did specialize; 10 of the 11 who entered practice are practicing general surgery, 4 in communities of less than 50,000 in size. Of the remaining 7, only 1 entered a specialty. Four practice in small- to medium-sized communities of less than 50,000 in size.

### Table 1. Characteristics of Residents

<table>
<thead>
<tr>
<th></th>
<th>Rural (n = 11)</th>
<th>Other (n = 59)</th>
<th>t Test</th>
<th>P Value for Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at residency completion, mean, y</td>
<td>35.0</td>
<td>34.7</td>
<td>.79</td>
<td></td>
</tr>
<tr>
<td>Sex, No.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>7</td>
<td>27</td>
<td>.34</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>4</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial intent to practice general surgery, No. (%)</td>
<td>6 (55)</td>
<td>14 (24)</td>
<td>.07</td>
<td></td>
</tr>
</tbody>
</table>
Western cities of populations between 68 000 and 225 000 and 1 in Honolulu, Hawaii. Among the 59 other residents who did not spend a year in our rural program, only 14 (24%) began residency intending to become general surgeons; 5 of these changed their minds during residency and are practicing in a specialty of surgery after completing fellowships. Thirty-two of the 59 (54%) initially planned to enter a specialty of surgery and followed through with plans to specialize, although not always in the specialty they had initially indicated. An additional 14 (24%) initially intended to further specialize but are practicing general surgery. Of the entire group of 70 who finished the OHSU residency during the last 8 years and are in practice, 38 (54%) practice general surgery, although 16 (42%) of these completed a fellowship, most commonly in minimally invasive surgery or critical care.

Table 2: Training and Practice Outcomes

<table>
<thead>
<tr>
<th></th>
<th>1993-2002 (n = 88)</th>
<th>2003-2012 (n = 70)</th>
<th>P Value for Difference (rural vs other, rural vs all general)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed fellowship</td>
<td>54 (61)</td>
<td>5 (45)</td>
<td>41 (69)</td>
</tr>
<tr>
<td>Practice general surgery</td>
<td>38 (43)</td>
<td>10 (91)</td>
<td>28 (47)</td>
</tr>
<tr>
<td>Practice site &lt;50 000</td>
<td>6 (7)</td>
<td>4 (36)</td>
<td>4 (7)</td>
</tr>
</tbody>
</table>

Figure. Program Participants

Fate of residents who completed residency and entered surgical practice from 2005-2012.

Discussion

Health policy experts estimate that 9.4 to 9.8 general surgeons per 100 000 population are needed to provide adequate surgical access to citizens of a region.6 United States data developed from the American Medical Association’s Physician Masterfiles by health researchers at the University of Washington showed that overall numbers of general surgeons per 100 000 population have dropped 25.9% over the past 25 years as more graduating surgeons further specialize. This decline has affected rural areas more severely than urban areas.1 Data from the US Atlas of the Surgical Workforce compiled by the American College of Surgeons Health Policy Research Institute showed significant disparity between urban and rural areas of every state, including Oregon in which urban and metropolitan counties averaged around 8 general surgeons per 100 000 population in 2008.7 Meanwhile, the figure for rural counties ranged from no general surgeons to 4.09 per 100 000 population.7 In addition, surgeons practicing in rural areas across the United States are older than surgeons practicing in urban or metropolitan areas, with a higher per-

discussions.
percentage in the 50- to 62-year age group and fewer younger than 40 years. Because the number of general surgeons finishing residency in the United States has been essentially unchanged for more than 30 years at just more than 1000 per year and almost 80% of these graduates enter fellowship and further specialize, the United States is faced with an increasing shortage of general surgeons. This shortage is compensated for in small part by recruiting foreign-bred or foreign-trained surgeons, but these surgeons must repeat some or all of their training to achieve board certification in the United States. The number of residency training positions in each program is fixed by the Residency Review Committee of the Accreditation Council of Graduate Medical Education. Although the number of residency positions is increasing slightly as some programs apply to increase their resident numbers and a few new programs open, these numbers are inadequate to fill the deficit. Furthermore, little progress can be made as long as up to 80% of surgery residents enter fellowships and practice in urban or metropolitan areas.

One of only 4 approved sites for general surgery residency training by the American College of Surgeons in 1939, the University of Oregon (now OHSU) initially produced almost exclusively general surgeons who populated the small towns and urban and metropolitan areas of our region. The increasing national trend toward fellowship training among surgery residents occurred to equal degree in our program between 1993 and 2002, with 61% of residents completing a fellowship and only 43% entering general surgery practice, only 6 of whom (7%) chose a rural (<50 000 population) setting. The trend toward specialization and urban practice was troubling because Oregon has many small towns with a need to replace its aging general surgeons.

Several studies have documented that practicing surgery in a small town or rural area involves knowledge of a larger variety of conditions and procedures than is required of general surgeons in more urban areas because the smaller communities are most frequently unable to support specialists. Particularly needed are skills such as Caesarean section and treatment of common gynecologic conditions, hand injuries, urologic emergencies, tonsillectomies, and fracture management. Surgery residencies whose residents rotate only to large urban or metropolitan hospitals are hampered in gaining adequate experience to treat these conditions by the presence of competing learners, residents in the specialties of surgery. Unless the residency does not have specialty residency programs, deliberate planning of a rural focus or track is necessary to demonstrate the joy of small-town living and impart confidence in an expanded set of knowledge and skills. The hospital in Grants Pass has surgical specialists in obstetrics-gynecology, orthopedics, urology, and otolaryngology but no residencies in these specialties to compete with the 2 general surgery residents for specialty experience. The residents who spend a year there are able to learn the medical and surgical management of the common problems in these specialties.

A handful of surgical residency programs have developed a rural focus or track in their residency and have been successful in influencing a significant number of their graduates to enter rural or small-town general surgery practice. Prominent sites include the University of North Dakota; University of Tennessee–Chattanooga; Bassett Healthcare in Cooperstown, New York; and Gunderson Clinic in LaCrosse, Wisconsin. This study is limited by the small numbers involved and the fact that it represents the experience of only 1 program. It must also be noted that residents who chose to spend a year at our rural site were likely more inclined toward a rural general surgery practice than those who remained in Portland. However, the good experience of that year by the early participants prompted residents who initially had not been so inclined to seek the experience of the year in Grants Pass, and 4 then opted to pursue careers in general surgery rather than a specialty. This study does add to a growing body of evidence that a well-planned effort to improve the likelihood that a resident will choose a rural or small-town general surgical practice can be successful. Multiplied many times over across other programs and combined with other complimentary strategies, the rural surgeon shortage might be addressed. Studies from programs that do produce a significant number of rural practitioners have shown that an individual is more likely to enter rural practice if he or she or their spouse grew up in a rural area. To our knowledge, it has not been clearly established whether a clinical experience in a rural site can influence residents to change their career plans from specializing and practicing in a higher-population area to choosing a rural or smaller-town practice site.

In our study, we demonstrated that our rural residency year can increase the likelihood that a general surgery resident will choose to practice in a rural area or town of less than 50 000. An initial desire to practice rural general surgery is also a predictor but occurred rarely in our cohort. Only 2 of 70 residents starting our residency expressed an interest in rural surgery. More significant was that all of the residents who initially desired a general surgery practice and went to our rural site are practicing general surgery, whereas only 64% who initially planned general surgery but did not go to Grants Pass ended up remaining in general surgery. The dedicated rural year did influence residents to remain in general surgery or convert to general surgery. Although 4 individuals who entered rural general surgery practice was not an adequate number to reverse the general surgery shortage, it is a beginning. Other programs, such as those previously mentioned with shorter rural experiences, have also succeeded in producing a higher percentage of graduates who enter rural or small-town general surgery practice. Replicating any of these programs in more residency programs could significantly increase the output of rural general surgeons. Even after a program is established, it requires a minimum of 5 years of experience before a result can be assessed.

A multifactorial approach is needed to address the rural surgeon deficiency, including cooperation among small hospitals and communities to regionalize care, an increase in remuneration and/or debt relief if individuals enter rural practice, and linkage to regional academic centers to pro-
vide rural surgeons both training opportunities in emerging techniques and help in caring for complex, high-risk patients. The foundation for building a vibrant rural surgery community is the educational partnership between regional rural surgeons and an academic medical center to provide student and resident training in the rural environment, exposure to rural surgery, and enticement to practice in a rural setting.

**REFERENCES**


