

Addressing Urban/Rural Disparities in General Surgical Services

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1 **Abstract**

2 While 21% of Americans live in rural areas, only 10% of surgeons practice in these
3 communities. Due to a shortage of all surgical services, the rural generalist often performs a
4 wide range of procedures that include emergency, obstetric, and urologic procedures commonly
5 performed by specialists in more urban areas. Given that practicing surgeons are declining in
6 number at the same time that surgical demand is rising, the lack of surgical services becomes a
7 significant barrier to healthcare access in rural communities. Reasons cited for declining
8 numbers include an aging workforce retiring younger, fewer medical graduates interested in
9 rural life, poor reimbursement, rising malpractice, insufficient training, and little access to
10 Continuing Medical Education. Policy suggestions discussed here include improving
11 recruitment of medical graduates by selective admissions criteria, offering specialized rural
12 training, alterations to reimbursement strategies, and adapting information technologies to
13 improve postgraduate education.

14

15 **Introduction**

16 Rural areas throughout the world experience a shortage of surgical services. The
17 increasing complexity of surgical procedures has led to concentration of manpower and
18 resources in larger cities (1). Patients living far from surgical centers face long healthcare
19 commutes, leading to lower utilization. Access to rural services has been a challenge for
20 developed nations with large rural populations, including Canada (1), Australia (2), and the
21 United States (3). The situation in the United States is especially complicated due to a complex
22 market-based medical economy. The problems of lower reimbursement, medical liability, and
23 infrastructure understandably differ between single-payer nations and the US. However, the
24 issues of low recruitment and retention of rural surgeons (in regards to training, lifestyle, and
25 satisfaction) affect all developed nations. They relate to the shared logistical challenges of

1 delivering complex care in isolated environments. The purpose of this article is to identify and
2 address the challenge of providing surgical services to rural populations in the United States.

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4 **The Challenge**

5 Rural America is one of the most medically underserved segments of the population.
6 The 2000 US Census reports that 21% of the US population (more than 55 million Americans)
7 live in rural areas* (4). Of those, 25.7 million (43%) live near a rural metropolitan area of
8 10,000-50,000 people; the remaining 29.3 million live in small or isolated communities (5). On
9 average, rural Americans tend to be older, have less access to healthcare, and be less healthy
10 than the nation as a whole (4, 6, 7). The National Health Interview Survey revealed that 9.2% of
11 rural Americans under 65 years report their health are “fair” or “poor” compared to 7.7% of
12 Americans in urban areas (8). The average age of rural residents is 38.1 years, compared to
13 the national average of 35.3 years (9). The life expectancy for rural populations is 71.5 for men
14 and 77.9 for women, compared to the national average of 74.4 years for men and 79.8 for
15 women (10). Eleven percent of rural residents live below the poverty line, which is lower than
16 the national average of 12.4%, although this figure does not include migrant labor (11).
17 Nonetheless, impoverished rural Americans are 21% less likely to access Medicaid and 33%
18 less likely to have private health insurance (7). The rural Medicare population similarly receives
19 fewer doctor visits than urban Medicare populations (12). Overall, it is estimated that rural
20 populations receive 20-30% fewer healthcare services than residents of urban areas (4).

21 Rural communities face a shortage of all physicians (13). While the availability of
22 specialty services is limited, family medicine (14) and general surgery (1) services are most
23 urgently needed. Only 9% of physicians and 10% of surgeons practice in rural areas (15).

* “Rural” is a definition of exclusion in the 2000 Census. Metropolitan areas are defined by the presence of an urban core of greater than 50,000 people. Metropolitan areas with an urban core of <50,000 are therefore rural. The 2000 Census breaks ‘rural’ into 2 categories. ‘Large rural’ refers to metropolitan cores of 10,000-50,000 people. ‘Small/isolated rural’ refers to all other locations. [7]

1 Thompson *et al.* (2005) studied the density of surgeons in various communities. Per capita, the
2 density of surgeons in rural areas (defined as a metropolitan core under 10,000) is 4.67 per
3 100,000 people, compared to 6.74 nationally (16). Rural communities in Indiana, Mississippi,
4 Missouri, Nevada, and Oklahoma have fewer than 3; rural Hawai'i has just 1.74 per 100,000.
5 Low provider density concentrates surgeons in larger rural areas, which lengthens the patient
6 commute by 2-3 times that of patients in larger communities (12).

7 The shortage of rural surgeons is likely due to a declining workforce combined with
8 fewer young surgeons choosing to practice in rural areas. As a group, rural surgeons are often
9 older: 51.6% of surgeons are over age 50 and only 15.2% are under 40 (16). There is a
10 national trend towards surgeons retiring at earlier ages (17), to which rural areas are not
11 immune. The situation is worsened by fewer medical graduates pursuing general surgical
12 practice, citing unpredictable work schedules, perceived high time commitment, perceived
13 stress level, and length of residency (18). Rural practice in particular has drawbacks to many
14 medical graduates, chiefly related to family and lifestyle factors (2, 19). The aptly named *trailing*
15 *spouse syndrome* has been cited as the biggest family factor (3, 4), whereby a well-educated
16 spouse is unable to find meaningful employment in rural communities. Dissatisfaction of the
17 spouse is often cited as a reason for surgeons to leave rural practice (2).

18 Many surgeons who do not retire choose to move their practices to urban areas (2).
19 Factors leading surgeons to leave rural practice are numerous (2, 4) and include poor
20 reimbursement (20), the rising costs of liability insurance (21), insufficient training (22, 23), and
21 little access to continuing medical education (CME) (19, 24). Rural providers depend more on
22 Medicare and Medicaid, which reimburse at lower rates than private insurance. Malpractice
23 insurance rates are rising everywhere. High rates are an important factor causing surgeons to
24 move their practices. In one notable example, 411 of 981 surgeons (42%) in rural Florida left
25 practice in 2003 due to medical malpractice premiums (25). Many surgeons cite insufficient
26 training as a drawback to rural practice (14). Rural surgeons perform a wider range of

1 procedures than urban colleagues, including obstetric, basic orthopedic, oncologic, and vascular
2 procedures (26, 27). Surgeons are often inadequately trained for perioperative care, critical
3 care, and anesthesia (4, 27). Professional isolation has also been cited as a major barrier for
4 rural surgeons (28). Opportunities for CME in rural areas are often limited due to long travel
5 distances and the inability to locate *locum tenens* (2). Indeed, respondents in one Canadian
6 study rated more opportunities for CME as the single most important factor towards improving
7 their rural practices (24).

8 Meanwhile, the demand for general surgical services is expected to rise by more than
9 30% in the next 15 years, worsening the labor shortage (4, 29). Basic generalist procedures
10 like colonoscopy and cholecystectomy are performed at comparable rates between urban and
11 rural hospitals (27). Lui *et al.* (2004) studied trends in demand for general surgical procedures.
12 The bread-and-butter procedures of rural surgeons include endoscopy, alimentary, and obstetric
13 procedures (30). By 2020, it is predicted that there will be an increase of 26% in the number of
14 laparoscopic cholecystectomies, 42% in bowel resections, 13% in appendectomies, 26% in
15 inguinal hernia repair, and 28% in breast excision (29). In addition, rural generalists often
16 perform hysterectomy, lithotripsy, prostate resection, and tympanostomy (27), procedures which
17 are performed by specialists in urban settings. As surgical subspecialties are increasingly
18 concentrated in large urban centers (31), often located far from rural areas, the number of these
19 procedures performed by rural generalists is expected to rise (28), particularly in emergency
20 situations (32).

21 Finally, limitations in rural facilities can impede access to surgical services. Rural
22 hospitals often have fewer beds and fewer inpatient operations per year; rural hospitals perform
23 fewer total outpatient procedures (27). More complicated cases are already referred to larger
24 centers capable of providing a specialized level of care (33). The wide range of procedures
25 performed by rural surgeons means that each specific procedure is performed less frequently.
26 It is generally accepted that better outcomes are associated with higher volume of each

1 particular surgery (31), particularly for many complicated procedures (34). The Leapfrog Group,
2 an advisory body that consults on issues of healthcare safety, has advised that volume-
3 dependent elective procedures be concentrated in high volume hospitals (35). While volume-
4 standards are demonstrably associated with improved outcomes including lives saved, the
5 closure of hospitals and the loss of local medical services poses important challenges for these
6 communities (36).

7 The challenges to providing surgical services in rural areas are remarkable. There is
8 already a disparity in healthcare access between urban and rural communities. It is important
9 that local communities retain surgical services. Policy effort should focus on several key areas:
10 prioritizing recruitment of young surgeons, lessening or removing barriers to rural practice, and
11 optimizing reimbursement schema. Solutions to these problems are achievable and will help
12 improve access to surgical services in underserved rural communities.

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14 **Rural Surgeon Recruitment**

15 One barrier is the shortage of surgeons pursuing rural practice. Several studies have
16 identified factors that predict rural recruitment. A New Zealand study identified the
17 characteristics of ten successful rural surgery training programs, including selective admission,
18 curricular focus on primary care, community-based teaching with community preceptorship, and
19 an interest in generalist medicine. The single strongest predictor of rural practice in this study
20 was rural background (37). A survey study of 456 rural physicians found that significant
21 retention factors include previous experience and preparation for small-town life and rural
22 rotations during residency and medical school (38). Medical graduates who ultimately practice
23 in rural Minnesota were born in rural areas and received education at in-state medical schools
24 (39). The common thread of several such studies is that future rural practitioners come
25 primarily from rural areas, express an early interest in general surgery, and are exposed to rural
26 practice sometime during medical school and residency.

1 One solution is to recruit more medical students from rural areas. Currently many
2 medical school entry assessments favor the recruitment of students from under-represented
3 minorities, including African Americans, US-resident Puerto Ricans, and Mexican-Americans.
4 Indeed, encouraging minority recruitment is a policy of the American Association of Medical
5 Colleges (AAMC), the accreditation body for US medical schools (40). An AAMC report notes
6 that graduates from minority backgrounds are more likely to practice in medically underserved
7 communities. A similar association is seen with rural background. A study from the Australian
8 Medical Workforce Advisory Committee (AMWAC) reports that students from rural backgrounds
9 are 2.9 times more likely to practice in rural areas and supports including rural background as a
10 factor in the selection of medical students (41). The use of rural background criteria can be
11 compounded with efforts to recruit under-represented minorities, noting for example that rural
12 blacks face distinctly greater challenges than urban blacks (10). Consideration of place of origin
13 is not without precedent in US medical school admissions. Puerto Ricans living in the United
14 States are considered a disadvantaged group (42) distinct from Puerto Ricans living in Puerto
15 Rico, which has three resident medical schools (43). Adjustment of medical school admissions
16 criteria to favor recruitment of students with rural backgrounds is a manageable and practical
17 solution to increase recruitment of rural doctors.

18 Most rural surgeons are generalists, and so suffer from a national trend towards
19 declining interest in general surgery among medical graduates (44). A report by Bland and
20 Issacs (18) of the residency choices of medical graduates found decreasing interest in general
21 surgery. Graduates in the study reported factors influencing their choice including residency
22 lifestyle and perceived lack of interesting cases. General surgeons work longer and less
23 predictable hours than other fields. Many students initially interested in general surgery change
24 their minds to pursue surgical or internal medicine specialties. Specialty services are less likely
25 to practice in rural areas owing to the complex nature of the procedures and insufficient patient
26 volume (31). Continuing medical education programs in specialty procedures can be used to

1 maintain interest. For example, a program run by the American Academy of Orthopedic
2 Surgeons trains generalists in orthopedic procedures (44). Similar programs could be
3 established for other specialties so that generalists can acquire a broad palate of skills.
4 Interestingly, many generalists already come from rural backgrounds, (39), and one survey of
5 56 generalists found that graduates of broadly based training programs were more likely to
6 pursue rural practice (45). Efforts to train and retain general surgeons are likely to
7 disproportionately aid recruitment of rural surgeons.

8 Recognizing the important role of mentorship and exposure, surgical training programs
9 should include rural rotations. The AMWAC study found that graduates of training programs
10 with rural rotations were 5.1 times more likely to practice in rural areas than graduates of
11 programs without (41). However, a recent survey of American surgical residency directors
12 revealed that just 36% of residency programs include a rural surgery curriculum, and that the
13 more prestigious programs were less likely to believe there to be a shortage of rural surgeons or
14 consider it part of their mission to train them (23). Training programs should be encouraged to
15 start rural rotations, particularly with community mentorship. A program at the University of
16 Alberta provides a 6-month rural medicine training program to teach the extra skills needed for
17 rural practice, such as anesthesia and obstetrics (1). Oregon Health & Science University offers
18 a 1-year fellowship in rural procedures at a rural satellite campus (44). While the American
19 College of Surgeons does not yet recognize rural surgery as a distinct residency program, at
20 least two rural surgery training programs have been established in the United States. The
21 University of Washington (46) serves as the sole medical school for the states of Washington,
22 Wyoming, Alaska, Montana, and Idaho (WWAMI), which together comprise 1/3 of the landmass
23 of the United States. Among other programs, the University of Washington offers a rural
24 surgery track within the general surgery residency program (47) where residents rotate through
25 rural hospitals throughout the WWAMI basin. Another program is the Mithoefer Center for Rural
26 Surgery (48) of the Bassett Healthcare system of Cooperstown, New York. Utilizing specialists

1 throughout upstate New York, the Mithoefer Center is able to offer a competitive program that
2 includes medical student clerkships, a residency program, and fellowships in surgical specialties
3 at sites across the rural healthcare system. As an excellent example of networking, regional
4 hospitals within the system specialize in different procedures, and students and residents rotate
5 through several hospitals in many communities for exposure to both generalist and specialist
6 procedures. While not standard, recognition of the distinct training needs of rural surgeons and
7 the value of community mentorship are important components for an effective training program.
8 Surgery residency programs should be encouraged to develop curricula such as these to
9 encourage more students to explore rural practice. Similarly, accreditation bodies may wish to
10 begin accrediting rural surgical programs.

11

12 **Removing Practice Barriers**

13 Many practicing rural surgeons move their practices to urban areas, citing location-
14 specific stressors (2). These factors, as we have already seen, include poor reimbursement,
15 rising malpractice insurance, poor access to CME, and the trailing spouse syndrome. The issue
16 of medical liability is very complicated; its scope exceeds this article. The problem of spouses is
17 inherent in rural practice and policy is unlikely to correct it (49). However, reimbursement and
18 CME can be addressed with concerted policy effort. Both issues are linked by the ecumenical
19 nature of rural practice, where reimbursements are low due to the small volume of each
20 procedure, and CME training is often inadequate to maintain the breadth of skills.
21 Accommodation to practice demands can therefore ease the burden for rural practitioners.

22 Reimbursements are low in rural areas because rural populations are more likely to use
23 Medicare and Medicaid and less likely to have private insurance. Both Medicare and Medicaid
24 reimburse at lower rates than private insurance owing to the complicated relative value unit
25 (RVU) system (50, 51). As a system, RVUs were instituted as a cost-saving measure under the
26 Balanced Budget Act of 1997. The RVU pays physicians by patient volume with adjustments by

1 specialty and expected time per procedure. RVUs are calculated via a 4-step formula (52). In
2 Step 1, a specialty-specific practice expense per hour is calculated using aggregate cost data.
3 In Step 2, an average number of hours spent treating Medicare patients is calculated, which is
4 then multiplied by the practice expense per hour; the value is called the *specialty specific*
5 *expense pool*. In Step 3, the specialty specific expense pool is allocated to specific procedures
6 performed by each specialty. Finally, in Step 4, for procedures performed by more than 1
7 specialty, the reimbursement is multiplied by the frequency with which each specialty performs
8 that procedure to produce a weighted average of allocations for the specialties that perform that
9 procedure. By this formula, rural surgeons are reimbursed poorly because they perform
10 relatively low volumes of each single procedure, and many procedures that they do perform are
11 uncommonly by general surgeons elsewhere (50, 51).

12 While there has been interest within the Department of Health & Human Services to
13 adjust the RVU formula, the current language of Medicare law prohibits alterations (52). There
14 are two possible solutions to improve reimbursements for rural surgeons: reclassify 'rural
15 surgery' as a separate specialty, or change the law. Because the RVU is calculated on a per-
16 specialty basis, it would be a simple solution to treat rural surgery as its own specialty. Practice
17 procedures and costs are clearly different for urban and rural generalists, so paying rural
18 surgeons on a scale distinct from their urban colleagues will change the RVU calculation such
19 that the specialty cost in Step 1 and the multiplier in Step 4 will both be higher. Alternately, the
20 law itself can be amended. Changes might include an exemption multiplier for practices in
21 medically underserved areas. Improvements in the reimbursement structure, however they are
22 accomplished, will make rural practice more attractive.

23 Opportunities for CME are often limited in rural areas (13, 24). Travel to academic
24 centers requires traveling long distances, and overnight stays necessitate hiring a *locum tenens*
25 to handle emergency cases (49). A recent advance in CME is the use of the Internet. Articles,
26 streaming video, and podcasts are now available as downloadable modules for CME (53).

1 Customers are able to view real-time procedures broadcast from distant academic centers.
2 Computer-assisted visualization modules are already available to help train osteopathic
3 students in musculoskeletal manipulation techniques and can be adapted to help surgeons (54).
4 Perhaps the most exciting innovation is the use of simulator technologies. Advanced simulator
5 technologies are already in use by the commercial airline industry (55) and the military (56) and
6 can be developed for surgeons. One study of a suturing simulator found that most surgeons
7 could develop satisfactory skills in just 4 hours (57). Virtual reality simulators are being
8 developed to train surgeons in minimally invasive techniques (58). Augmented reality is an
9 emerging simulation technology that allows surgeons to practice skills on advanced models
10 aided by virtual reality technology (59). Because simulations cannot make up for the human
11 component of CME, it is also necessary to develop better job-share programs and provide
12 financial assistance for *locum tenens*, perhaps in the form of government grants (4, 19, 49).
13 Ultimately policies that allow better networking will help reduce concerns about inadequate
14 training among surgeons (4).

15

16 **Rural Hospitals**

17 Surgery requires operating rooms, efficient perioperative care, and reliable intensive
18 care resources—in short, a hospital. Rural hospitals have operated on a close margin in recent
19 years. Hospitals, like surgeons, are reimbursed by RVUs under the Balanced Budget Act of
20 1997. However, the criteria costs for hospitals is figured differently. Hospitals may bill only for
21 services associated directly with patient care, while infrastructure (eg, swing beds to move
22 patients) is not included (60). Reductions in Medicare and Medicaid payments between 1997
23 and 2003 hit rural hospitals hard and led to a number of hospital closures (50, 51, 60). Policy
24 changes such as the Balanced Budget Refinement Act of 1999, the Medicare, Medicaid, and
25 SCHIP Benefits Improvement and Protection Act of 2000, and the Medicare Modernization Act
26 of 2003 (which created a special category of Critical Access Hospitals) have helped restore

1 financial solvency to rural hospitals (60). However, the fragility of rural hospitals belies the care
2 that must be undertaken with adjustments to hospital reimbursements.

3 Regionalization is a new development in healthcare finance. Regionalization is the
4 concentration of surgical services in centers with the best outcomes. The basis for this policy is
5 a landmark study by Birkmeyer *et al* which showed that positive outcomes from surgery were
6 strongly correlated with surgical volume (31). As one commentator sardonically pointed out, a
7 patient in Manhattan could reduce their risk of mortality during colectomy by 80% by simply
8 “walking across the street” (27), in reference to the rather large difference in outcomes between
9 neighboring hospitals with different surgical volumes (61). Regionalization is an effort by third
10 party payers to adjust payments to favor those high-volume centers with the best outcomes.
11 Policies advocate the maintenance of volume-standards as a prerequisite for full
12 reimbursement. The Leapfrog Group, which consults on regionalization, now advocates
13 reimbursement schema that favors hospitals with better outcomes (35), to allow patients to “vote
14 with their feet” (27).

15 Rural hospitals are at an obvious competitive disadvantage under volume standards.
16 We have already discussed how rural surgeons perform a wider range of procedures than urban
17 colleagues, so that it is difficult for rural surgeons to maintain volume standards in specific
18 procedures competitive with more populated areas (34). Rural hospitals may face situations
19 where third-party payers direct patients towards distant urban hospitals with higher volumes and
20 better outcomes. This especially becomes an issue because rural hospitals may rely on
21 payments from surgical services for up to 40% of their revenue (62). The loss of surgical
22 volume may place too great a burden on rural hospitals, which, given the financial instability of
23 these hospitals (60), may force reduction in services or closure (63). It is now an important
24 question as to whether a rural community will be better served with better outcomes from distant
25 hospitals.

1 Recent work suggests a solution. Studies suggest that some procedures are more
2 sensitive to the volume-effect[†] than others (31, 34). Volume-dependent procedures include
3 many highly invasive procedures not commonly performed electively in rural settings, such as
4 many complex gastrointestinal and heart operations. In contrast, many surgeries common to
5 rural practice, such as nephrectomy, colectomy, carotid endarterectomy, and lower extremity
6 bypass, have only a weak volume-effect (<2% difference in mortality). Low volume-effect
7 procedures account for 88% of invasive procedures (34) and 97.9% of surgical revenue at rural
8 hospitals (63). These studies suggest that a conservative approach to regionalization can
9 comfortably exempt certain procedures with a low volume-effect without significantly impacting
10 either patient care or the financial viability of rural hospitals (63). Conservative regionalization
11 should be viewed as a positive change and actively pursued by policy-makers for its
12 improvement in outcomes and minimal effect on rural hospitals.

13

14 **Concluding Statements**

15 Rural surgeons play an important role in the health of their communities by providing
16 essential services that could otherwise only be available in distant cities. Unfortunately, there
17 are not enough surgeons to meet the demand, and it is expected that the surgeon-deficit will
18 grow in the near future. We have here reviewed several barriers to care, including low
19 recruitment, poor retention, low reimbursement, professional isolation, and regionalization.
20 Numerous studies suggest ways that recruitment can be increased through undergraduate and
21 postgraduate medical education. Payments in a market-based system can be adjusted to raise
22 reimbursements for rural providers and maintain the solvency of rural hospitals. Emerging
23 information technologies can soon bring quality CME right to the rural operating room. Given
24 the large and growing need and the availability of policy options, retention of services in rural

[†] A 'high-volume' effect is defined by the authors as a >2% difference in mortality between high- and low-volume centers. A 'low-volume' effect is defined as <2% mortality difference. [38]

1 areas should now be a priority for healthcare policy in the United States. It is possible now to
2 improve access to rural surgical services with a multi-disciplinary approach that includes
3 industry, government, and education.
4

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