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Surgical specialty procedures in rural surgery practices: implications for rural surgery training

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Abstract

BACKGROUND: Specialty procedures constitute one eighth of rural surgery practice. Currently, general surgeons intending to practice in rural hospitals may not get adequate training for specialty procedures, which they will be expected to perform. Better definition of these procedures will help guide rural surgery training.

METHODS: Current Procedural Terminology codes for all surgical procedures for 81% of North Dakota and South Dakota rural surgeons were entered into the Dakota Database for Rural Surgery. Specialty procedures were analyzed and compared with the Surgical Council on Resident Education curriculum to determine whether general surgery training is adequate preparation for rural surgery practice.

RESULTS: The Dakota Database for Rural Surgery included 46,052 procedures, of which 5,666 (12.3%) were specialty procedures. Highest volume specialty categories included vascular, obstetrics and gynecology, orthopedics, cardiothoracic, urology, and otolaryngology. Common procedures in cardiothoracic and vascular surgery are taught in general surgical residency, while common procedures in obstetrics and gynecology, orthopedics, urology, and otolaryngology are usually not taught in general surgery training.

CONCLUSIONS: Optimal training for rural surgery practice should include experience in specialty procedures in obstetrics and gynecology, orthopedics, urology, and otolaryngology.

In the United States, approximately 56 million people or 18% to 20% of the population live in rural locations.[1] Physician supply in rural areas is generally one half to two thirds of the supply in metropolitan areas.[2,3] The critical shortage of general surgeons in rural settings in the United States has been increasingly documented and publicized in the past decade.[2,4] The importance of curtailing this shortage by increasing the number of rural surgeons cannot be underestimated. The very core of access to the health care system for rural citizens is at risk.[5]

Characterization of practice patterns in a rural surgery practice is difficult because of the lack of data and the variation in types of procedures performed in rural surgery practices in different areas of the country. In many respects, the type of procedures a rural surgeon is expected to perform can vary greatly depending on multiple factors, including the size of the community, the location of the community, proximity to a major medical center, the availability of subspecialists, the capabilities of the hospital, and the needs of the community.

Recently, there has been increased attention to the plight of rural surgeons and the surgical needs of rural America. Prominent surgical societies including the American Board of Surgery and the American College of

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Table 1 All procedures performed by rural surgeons (n = 46,052)

Procedure	Procedure frequency, All surgeons*	CCS codes
Appendectomy	1,030 (2.2%)	80
Bowel (small and large)	1,507 (3.3%)	72, 73, 75, 78, 79, 92, 95, 96
Breast	2,278 (4.9%)	165, 166, 167, 174, 175
Cholecystectomy/common bile duct exploration	2,891 (6.3%)	84
Endocrine	126 (.3%)	10, 11, 12
Endoscopy	18,307 (39.8%)	68, 69, 70, 76, 82
Esophagus/stomach	740 (1.6%)	71, 74, 93, 94
Hernia	2,841 (6.2%)	85, 86
Liver/pancreas	175 (.4%)	245, 246
Other abdominal	651 (1.4%)	87, 88, 89, 90, 97, 99
Rectal/anal	1,252 (2.7%)	77, 81
Skin/soft tissue	8,240 (17.9%)	168, 169, 170, 171, 172, 173
Spleen/lymph	329 (.7%)	66, 67
Trachea	19 (.04%)	34, 35
Specialty procedures	5,666 (12.3%)	See Table 2
Total	46,052 (100%)	

*Percentages are based on the total frequency of general and specialty procedures.

Surgeons have recognized the issues in rural surgery and made efforts to improve the education, training, and supply of rural surgeons. Appropriately, several general surgery training programs have developed rural surgery training tracks. Yet actual documentation of a curriculum for such training programs has not yet existed. Information on the subspecialty procedures performed by rural surgeons allows for creation of a procedure guide for surgeons who wish to practice in rural environments. Such information will be helpful in developing effective rural surgery training programs.

Methods

The methods for data collection in the Dakota Database for Rural Surgery (DDRS) have previously been described in detail.[6] Briefly, all rural surgeons in North Dakota and South Dakota were identified through state chapters of the American College of Surgeons using rural urban commuting area codes. Current Procedural Terminology (CPT) data on all surgical procedures (both inpatient and outpatient) performed in these practices during 2006 were gathered and entered into the DDRS. These data were analyzed using Clinical Classification Software (CCS) codes, which condense all CPT codes into 246 clinically relevant categories for analysis.[7] The CCS codes relevant to general surgery (14 categories) and surgical subspecialties (8 categories) were then used to analyze the categories of procedures performed by rural surgeons in the DDRS (Tables 1 and 2). Initial results of this analysis have been previously reported.[6] This report represents a more in-depth analysis of individual CPT codes for the specialty procedures performed by the rural surgeons in the DDRS. The most frequently performed procedures in each of the CCS codes for the 6 highest volume specialty areas were analyzed to obtain the most common procedures performed by rural surgeons in each of the subspecialties. The 3 most common procedures in each specialty area were then assessed for obtainability of acquiring technical competence within current general surgical residency training guidelines by comparison with the

Table 2 Specialty procedures performed by rural surgeons (n = 5,666)

Specialty procedure	Procedure frequency*	CCS codes
Cardiothoracic	624 (11.0%)	36–42, 44, 48, 49
Neurosurgery	212 (3.7%)	3–9
Obstetrics/gynecology	1,063 (18.8%)	119–132, 134, 137, 140
Ophthalmology	28 (.5%)	19
Orthopedics	857 (15.1%)	142, 143, 145–148, 152, 153, 155–164
Otolaryngology	240 (4.2%)	23, 25–27, 30–33
Urology	517 (9.1%)	100, 104, 106, 109–112, 114–118
Vascular	2,125 (37.5%)	51–57, 59–61, 63
Total	5,666 (100.0%)	

*Percentages are based on the frequency of all specialty procedures.

Surgical Council on Resident Education (SCORE) curriculum.[8] The SCORE curriculum, a standardized national curriculum for general surgery training, categorizes procedures that are included in general surgery residency training into 3 levels: (1) essential common—frequently performed operations in general surgery (specific procedure competency is required by end of training); (2) essential uncommon—rare, often urgent, operations seen in general surgery practice but not typically done in significant numbers by trainees (specific procedure competency required by end of training); and (3) complex—not consistently performed by general surgeons in training and not typically performed in general surgery practice (generic experience in complex procedures is required but not competence in individual procedures). Procedures that are considered part of the SCORE standardized curriculum for general surgery residency training in the essential common and essential uncommon categories were considered available for general surgery residents to gain competence in during general surgery residency training, while procedures that were either not within the SCORE curriculum or were listed in the complex category were considered to warrant additional specialty training for surgeons who plan to practice in rural locations.

Analysis of the data was performed using SPSS version 18 (SPSS, Inc, Chicago, IL).

Results

The DDRS contains a total of 46,052 procedures performed by 43 (81%) of the eligible 53 rural surgeons in North Dakota and South Dakota in 2006. Analysis of these data demonstrated that rural surgeons averaged 1,071 procedures/year, composed of 47.9% general surgery, 39.8% endoscopy, and 12.3% surgical specialty procedures. When analyzed by CCS categories for general surgery, 40,386 (87.7%) of the procedures (CCS classifications included endoscopic procedures in the general surgery categories) were classified as general surgical procedures, which have been previously reported on and were not analyzed in this study[1] (Table 1). Analysis of the 5,666 (12.3%) surgical specialty procedures using CCS codes demonstrated that the top 6 specialty areas in which rural surgeons performed procedures included vascular surgery (37.5%), obstetrics and gynecology (18.8%), orthopedic surgery (15.1%), cardiothoracic surgery (11%), urology (9.1%), and otolaryngology (4.2%) (Table 2). The 3 most frequently performed procedures for the leading CCS categories in each of the specialty areas are shown in Table 3. Table 4 compares the 3 most frequent procedures in each of the highest volume specialty areas to procedures that current general surgery residents should be competent in by completion of residency as listed in the SCORE curriculum. The most common procedures performed by rural surgeons in the vascular and cardiothoracic specialties are commonly taught in general surgery residencies, while the most common procedures in obstetrics and gynecology, orthopedics, urology, and otolaryngology are not commonly taught in general surgical residency programs.

Comments

The differences between a rural surgery practice and a metropolitan or suburban general surgery practice have been examined and reported on in several publications over the past 2 decades. Ritchie et al[9] analyzed the operative logs from general surgeons who took the American Board of Surgery recertification examination from 1995 to 1997. Rural surgeons, as defined by metropolitan statistical area methodology, were found to have performed substantially more total procedures than did their urban counterparts. Most of this disparity was due to endoscopic procedures. A study by Heneghan et al[10] in 2005 identified rural surgeons from the American Medical Association Masterfile and surveyed them on job and community satisfaction, factors influencing their decisions to practice in rural locations, spectrum and volume of cases, and educational needs. The response rate was 24.7%, with the self-reported data on practice patterns also demonstrating significant differences in rural and urban general surgery practices. Rural surgeons reported a statistically significant higher volume of endoscopic, urologic, and obstetric and gynecologic procedures. A 2011 study by Valentine et al[11] also from the American Board of Surgery recertification operative logs again demonstrated similar differences in rural and urban practices with higher volumes of endoscopy and fewer traditional general surgery procedures in the rural practices. Much of the data in these studies were limited to general surgical procedures, which does not provide insight into specialty procedures outside of standard general surgical procedures. This study represents a more accurate view of a rural surgeon's practice in that actual CPT codes for all inpatient, outpatient, and minor surgical procedures in rural surgery practices were entered into the database. A previous report[6] from this database also confirmed the significant differences in rural surgery practices, in addition to demonstrating that specialty procedures account for almost one eighth of a rural surgeons total practice and >20% of a rural surgeon's nonendoscopy practice. Specialty procedures are a significant part of a rural surgeon's practice, and rural surgeons provide rural communities with services that they may have to travel long distances to obtain and otherwise are not available in emergent situations. With this study, we sought to better characterize the types of specialty procedures that rural surgeons typically perform and determine whether standard general surgery residency training adequately prepared them for this type of practice.

Detailed analysis of the specialty procedures in the 6 highest volume specialty categories showed that the frequency of the top 3 procedures in these specialties ranged

Table 3 Top 3 specialty procedures in each specialty by CCS codes (n = 3,204)

Specialty procedure (Rank)	Specialty procedure frequency*	CCS codes	CPT procedure frequency†
Vascular (1)	2,125 (37.5%)	51–57, 59–61, 63	Central line/port insertion (34.6%) Removal port/central line (12.8%) Vein ablation/stripping (12.7%)
Obstetrics/gynecology (2)	1,063 (18.8%)	119–132, 134, 137, 140	Cesarean section (24.3%) Hysterectomy (15.4%) Tubal ligation (13.5%)
Orthopedics (3)	857 (15.1%)	142, 143, 145–148, 152, 153, 155–164	Arthrocentesis joint/bursa (14.3%) Amputation AKA/BKA/digit (10.7%) Ganglion cyst excision/injection (10.3%)
Cardiothoracic (4)	624 (11.0%)	36–42, 44, 48, 49	Chest tube/thoracentesis (49.5%) Bronchoscopy ± biopsy (20.1%) Pacemaker insertion/removal (7.5%)
Urology (5)	517 (9.1%)	100, 104, 106, 109–112, 114–118	Vasectomy (50.9%) Hydrocoele/spermatic cord lesion excision/drainage (18.4%) Circumcision (5.8%)
Otolaryngology (6)	240 (4.2%)	23, 25–27, 30–33	Tonsillectomy + adenoidectomy (49.3%) Tympanostomy (16.7%) Control nasal hemorrhage (4.6%)
Total	5,666 (100.0%)		3,204 (57%)

AKA = above-knee amputation; BKA = below-knee amputation.
*Percentages are based on the frequency of all specialty procedures.
†Percentages are based on the frequency within the specialty.

from 35.3% (orthopedics) to 77.1% (cardiothoracic) of the total procedures in that specialty (Table 3). Although the listed top 3 procedures in each specialty account for the majority (57%) of the procedures in these specialties, it should be noted that there were many other lower frequency procedures that were performed in these specialties by rural surgeons in the DDRS. When assessing these procedures in comparison with procedures in which competency is required in general surgery training (Table 4), it is apparent that most of these procedures in vascular and cardiothoracic surgery are usually part of standard general surgery training. Conversely, in the specialties of obstetrics and gynecology, otolaryngology, urology, and orthopedics, most of the procedures are not considered part of standard general surgery training. Although this may seem intuitive, it does call into question the need for training in these specialty areas for surgeons who plan to practice in rural areas. In the past, before the current degree of specialization in medicine, when general surgeons were expected to be knowledgeable and somewhat proficient in many areas of surgery, rotations in many specialty areas were included in general surgery training. Currently, with specialists readily available in most metropolitan and suburban areas, the need for general surgeons to be proficient in many of these specialty areas is rare. The data on obstetric and gynecologic procedures are illustrative of this dilemma for rural surgeons. In metropolitan areas, general surgeons rarely will be involved in or perform hysterectomies or cesarean sections, because there is generally a plentiful supply of obstetrics and gynecology colleagues to provide the necessary care for patients who need these services. In rural locations, the opposite is true, with many small rural communities unable to support a full-time obstetrician and gynecologist. In these communities, the emergent and sometimes routine care for these conditions and procedures often falls upon general surgeons, who may be the only surgical providers in the communities. Familiarity with and competence in these types of specialty procedures are critically important for rural surgeons, who may be performing these procedures for their communities out of necessity or convenience. It seems log-

Table 4 Specialty procedures and general surgery residency training

Specialty	Procedure	General Surgery Training*
Vascular	Central line/port insertion	Yes
	Removal port/central line	Yes
	Vein ablation/stripping	Yes
Obstetrics/gynecology	Cesarean section	No
	Hysterectomy	Yes
	Tubal ligation	No
Orthopedics	Arthrocentesis joint/bursa	No
	Amputation AKA/BKA/digit	Yes (partial)
	Ganglion cyst excision/injection	No
Cardiothoracic	Chest tube/thoracentesis	Yes
	Bronchoscopy ± biopsy	Yes
	Pacemaker insertion/removal	No
Urology	Vasectomy	No
	Hydrocoele excision/drainage	Yes (partial)
	Circumcision	No
Otolaryngology	Tonsillectomy + adenoidectomy	No
	Tympanostomy	No
	Control nasal hemorrhage	No

*Based on inclusion within SCORE standardized general surgery residency curriculum essential common and essential uncommon procedures.

ical and would be of great benefit to the patients of these communities that general surgeons who intend to practice in rural communities have the ability to perform these procedures with skill and competence. Understandably, the requirements for any particular location may vary depending on the proximity to and availability of specialists, but the data from this study indicate that in many cases, rural general surgeons are providing these services. The necessity to be trained in these procedures before entering practice in rural locations seems obvious.

Another area in which competence is necessary and almost mandatory for rural surgeons is endoscopy. Rural communities rarely have access to a gastroenterologist, so the proficient provision of endoscopic services is very important for rural surgeons. Unfortunately, in many general surgery training programs, the ability to get adequate training in endoscopic procedures is limited and may be dependent on gastroenterologists, who sometimes are reluctant to train general surgeons in these procedures. The data from our study and many other studies underscore the number of endoscopic procedures performed by surgeons in rural settings. Appropriate training and expertise in common endoscopic procedures is a necessity for rural surgeons, often requiring additional experience than is provided in most general surgery training programs.

Alternative solutions for training of general surgeons who plan to practice in rural surgery areas include additional fellowship training for procedures that they will be expected to perform in the rural areas in which they plan to practice. This option allows for selective training for procedures that are needed in that community without additional training in procedures that rural surgeons would not use. We feel that the specialty areas that we recommend on the basis of this study would give rural surgeons a broader based surgical education and allow for them to be comfortable in all types of general surgical and surgical specialty care, whether they perform procedures in those areas or not. This would enhance the health care of patients in rural areas before or in place of referral to a surgical specialist. A less desirable alternative would have rural surgeons decline to provide the surgical specialty care needed and refer those patients to centers with the appropriate specialists available. This option has been referred to in the past by leaders in academic surgical societies but has not proven to be practical or feasible, because most rural patients would prefer to get their medical care in their own communities, and referral in some situations can threaten the well-being of patients and/or children (eg, emergency cesarean section).

It should be noted that although these data provide an evidence-based example of a procedure guide for training rural surgeons, they are based on data from rural surgery practices in North Dakota and South Dakota and may not apply to all programs and rural surgery settings. As in most rural areas of the United States, the states of North Dakota and South Dakota are experiencing a shortage of rural surgeons to meet the needs of their rural communities. In response to these needs, in the University of North Dakota General Surgery Residency Program, a rural surgery track was recently implemented to alleviate this shortage. The results of this study were incorporated in the development of the curriculum for training general surgery residents who wish to practice in rural surgery locations (Table 5).

Conclusions

Data from this study indicate that specialty procedures are an important part of a rural surgeon's practice, helping fulfill the health care needs of their communities. Optimal

Table 5 University of North Dakota rural surgery tract curriculum*

Postgraduate year	Rural rotations (1 Month)		
2	Obstetrics/gynecology	Rural surgery	Ear, nose, and throat
3	Urology	Orthopedic surgery	Endoscopy
4	Rural surgery	Obstetrics/gynecology	elective

*The rural surgery tract curriculum includes 3 months of rotations in rural surgery and specialty areas in postgraduate years 2 to 4 but otherwise is the same as standard general surgery training.

training for rural surgeons should include experience in the appropriate specialty areas determined by the location and needs of the community but in most cases should include either new or additional experience in endoscopy, obstetrics and gynecology, orthopedics, urology and otolaryngology. Training of rural surgeons in these specialties will improve the safety and efficacy of surgical services in rural communities.

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Discussion

Dr Bill Rainer (Cortez, CO): Dr Sticca and the Surgery Department of the University of North Dakota can always be trusted to provide some valuable insights into rural surgery topics. My first question, one of methodology, is why you decided to exclude neurosurgery from the highest volume specialty areas performed by the rural surgeons. Was it simply because the procedure frequency was below 4% of the total, which is only one half percent less than ENT, and how did you arrive at this threshold? There is an argument that some neurosurgery capability might be of value in the rural settings. I put my 22 years of rural surgical procedures through your same analysis and I found that I also had significant numbers of the same cases in these specialty fields. But my frequencies differed from those of your study within a range of about 17 percentage points. My frequencies of specific procedures within each specialty differed within a range of 46 percentage points. I did 17% fewer chest tubes and 29% more tonsillectomies. Your study might have shown the same finding had you included the ranges of frequencies of the specialties and their commonest procedures. So at the risk of being charged of plagiarism or at least lack of imagination, I would like to repeat the question that Dr Kim asked last year in his discussion of your previous paper. Do you really believe that rural surgeons' practices are similar enough to have a standardized rural surgery curriculum or do you think that residents would be better served to have the flexibility in their final year to acquire a customized skill set based on the needs of their specific practice location? Finally, I would like to ask you to speculate on the ramifications of your conclusions. I was asked 12 years ago to respond to a proposal for an alternative rural track in surgical training and I expressed my concern about fragmentation within the sphere of general surgery. Since then we have entered the era of fragmentation. General surgeons are limiting their practices. Maintenance of board certification is tailored to these limitations. I am concerned that if we go along with this trend and create a different rural surgery curriculum, will we finally and completely lose the ability of general surgeons to change direction or location within their careers?

Dr Brady C. Mullin (Grand Forks, ND): Thank you for your questions and for your insight. I think your questions point to a lot of the overall issues surrounding general surgery today in terms of the overall centralization of surgery and its subspecialties. I think that to further separate rural surgery out from general surgery would, indeed, be a disservice to general surgeons' training. If, however, rural training is viewed as additional training, it can be seen as a further enrichment of training that allows for better prepa-

ration for practice. At University of North Dakota, those of us on the rural tract complete the usual requirements and are fortunate to have the opportunity to do this additional training. This is exactly how I view it—additional. If it were simply further fragmentation of training it would, indeed, be far from ideal. In terms of excluding neurosurgery, basically we had to draw the line somewhere. Initially, our goal was to present and incorporate the top 5 subspecialties. ENT was seen to be the sixth top subspecialty procedure, with the most commonly performed procedures being the relatively simple and learnable tonsillectomy and adenoidectomy. These classic ENT procedures are not covered in most general surgery training. In our data sample, more than 85% of the neurosurgery procedures performed were carpel tunnel releases. Carpel tunnel release is not an example of a classic, life-saving neurosurgery procedure that would be of value in a rural setting and require additional training. Thus, neurosurgery was not included. Ultimately, the line has to be drawn somewhere to still allow for adequate time for a complete general surgery training. I think that an important note you bring up is in regards to the differences between rural practices throughout the country. This is a survey of surgeons in North and South Dakota, which would presumably differ from a survey of surgeons in rural areas in other parts of the country. I think you certainly have to be careful applying it directly from 1 area to the next. Ideally, each resident could tailor training for the area of the country that he or she hopes to serve. In reality, however, this would be difficult logistically for each residency program. Not to mention, the activities of rural surgeons in most rural locations in this country have not been well documented. Although the shortage of surgeons in rural America has been discussed nationally for over a decade, solutions to the shortage have not been adequately addressed. We've been flying blindly to a certain extent, not knowing how to better prepare surgeons to address this shortage. Although it cannot be perfectly applied to every rural setting in the country, I think it is certainly a great start. It is a data set that guides additional training, and is more than what has been guiding most rural training programs up until this point. At the very least, it will be well applied in North and South Dakota.

Dr Kenric Murayama (Philadelphia, PA): I have 1 comment and 1 question. I was impressed by the data you showed and for a fleeting moment thought, "That almost looks like a primary care/family practice residency." So I guess the question is in a place that I assume has a fair primary care training presence, how do you compete with those training programs and how do the program directors decide how are you going to divide up those experiences because at least where I am from, we do have a primary care residency and they rotate on ob/gyn, they rotate on orthopedics, and they do the outpatient care primarily. They rotate on our general surgery service and are very interested in trying to learn how to do office based procedures and it seems there would be a direct conflict in those situations.

Dr Mullin: Thank you for the question. How to divide it? I suppose I'm not quite sure. It seems there has always been some crossover between primary care physicians and surgeons practicing in rural settings. There likely always will be. Indeed, primary care physicians adequately performing office-based procedures may help take some of the burden off of rural surgeons. We certainly have family medicine residents in some of our hospitals as well. Though they rotate on OB in their training, they do not perform C-sections. Surely in the future, increasing work-hour restrictions in training will continue to limit the amount of procedure-based training that primary care physicians will receive. Still the main dividing line will be the obvious: family practice physicians are not surgeons. It is important that primary care physicians are adequately trained to do some, mostly office-based, procedures. Yet, being trained to do a procedure is vastly different than being trained to operate. At critical times, I assume most patients, and most people in this room for that matter, would want a surgeon to be the one holding the scalpel.