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Rural surgical services in two Canadian provinces

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See also Editorial page 183, accompanying articles, pages 187 and 195, and Podium piece, page 218.

Objective: Contrast alternative health delivery systems and the use of differently trained physician providers in the supply of surgical services to rural residents in 2 Canadian provinces.
Methods: Four surgical procedures (carpal tunnel release, inguinal herniorrhaphy, appendectomy and cholecystectomy) provided to rural residents of Alberta and Northern Ontario were identified between 1997/98 and 2001/02. Surgical staff were identified as specialists or non-specialists. Rural populations were mapped into the catchment areas of rural acute care facilities. Rural surgical programs were characterized by the level of surgical service available locally.
Results: Alberta and Northern Ontario have a similar number of rural surgical programs staffed by Canadian-certified general surgeons (10 and 12, respectively). However, Alberta has 27 smaller rural surgical programs staffed by non-specialist surgeons and Northern Ontario has only 4. These non-specialist surgeons play a significant role in Alberta, often in collaboration with specialist surgeons. In Northern Ontario the non-specialist surgeons play a minor role. The small rural surgical programs in Northern Ontario that are staffed by specialist surgeons are significantly more successful in retaining the local surgical caseload compared with similar programs in Alberta.
Conclusions: The principal differences between Alberta and Northern Ontario in the delivery of rural surgical services are the greater number of small rural surgical programs in Alberta, and the substantial role of non-specialist surgical staff in these programs.

Objectif : Comparer d'autres systèmes de prestation de services de santé et le recours à des médecins qui ont reçu une formation différente pour fournir des services chirurgicaux aux populations rurales de deux provinces du Canada.
Méthodes : On a choisi quatre interventions chirurgicales (libération du nerf médian au niveau du canal carpien, herniorrhaphie inguinale, appendicectomie et cholécystectomie) fournies aux populations rurales de l'Alberta et du nord de l'Ontario entre 1997/98 et 2001/02. On a réparti le personnel chirurgical en chirurgiens spécialisés et non spécialisés. On a cartographié les populations rurales en fonction des bassins des établissements ruraux de soins actifs. On a caractérisé les programmes de chirurgie en milieu rural en fonction du niveau des services locaux de chirurgie offerts.
Résultats : L'Alberta et le nord de l'Ontario ont un nombre semblable de programmes de chirurgie en milieu rural offerts par des chirurgiens généraux certifiés au Canada (10 et 12 respectivement). L'Alberta compte toutefois 27 programmes de chirurgie en milieu rural de moindre envergure offerts par des chirurgiens non spécialisés et le nord de l'Ontario en a quatre seulement. Ces chirurgiens non spécialisés jouent un rôle important en Alberta, souvent en collaboration avec des chirurgiens spécialisés. Dans le nord de l'Ontario, les chirurgiens non spécialisés jouent un rôle mineur. Les programmes ruraux de chirurgie d'envergure modeste du nord de l'Ontario offerts par des chirurgiens spécialisés connaissent un degré de succès significativement plus élevé que les programmes semblables en Alberta lorsqu'il s'agit de garder les cas locaux de chirurgie sur la scène locale.
Conclusions : Les principales différences entre l'Alberta et le nord de l'Ontario dans la prestation de services de chirurgie en milieu rural sont les suivantes : l'Alberta compte plus de programmes ruraux de chirurgie d'envergure modeste et les chirurgiens non spécialisés y jouent un rôle important.

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Introduction

The challenge of ensuring that there are an appropriate number and type of health care providers to meet the needs of rural Canada has been a chronic problem. Evidence suggests that this situation is becoming more pressing.[1] The provision of surgical care is particularly important. Surgical services are acutely needed in certain situations, when patients may be too ill to be safely transferred. The presence of a surgical service can help support other rural programs, such as obstetrics, and encourage recruitment and retention of family physicians who wish to work with some "back-up" (see p. 218).[2]

Staffing of rural surgical programs (RSPs) is a challenge. Compared with their urban counterparts rural surgeons work in relative isolation with fewer resources (e.g., diagnostic tools, critical care beds) and often have to provide a broader range of procedures.

In Alberta and in Northern Ontario, the provision of surgical services to rural Canadians poses significant geographic challenges. The distances are large, and the population densities small. Northern Ontario occupies approximately 910 000 km^2, with a population of slightly less than 400 000 residing outside its cities. Alberta covers approximately 662 000 km^2, with approximately 500 000 residing outside of its cities.

Studies for Western Canada describe the delivery systems for RSPs.[3,4] Three types of RSPs have been identified: comprehensive (including tertiary care services, provided in the Metropolitan centres); Regional centres (with a full range of generalist specialists); and Rural. RSPs are staffed by a small number of Canadian-certified specialist surgeons supported by non-specialist surgical staff, including international medical graduates (IMGs) with an advanced level of training, and family physicians with 12 months of surgical training beyond their initial primary care training.

By contrast, little has been published about RSPs in Northern Ontario. Many of the specialist surgeons are supported by alternative payment plans (e.g., Northwest Ontario Surgical Program). Historically, the physician licensing colleges in the 2 provinces have had different approaches to the assessment and licensing process for incorporating IMGs into the medical workforce.

The objective of this study is to describe and contrast some of the delivery characteristics of surgical services provided to the rural residents of Alberta and Northern Ontario. This study may help health human resource planning for RSPs as well as guide training programs for surgeons and family physicians.

Methods

For the study, 4 surgical procedures were identified over a 5-year period (i.e., between 1997/98 and 2001/02). The procedures chosen for study were of low to medium complexity, relatively common and could be provided by physicians with different levels of surgical training: carpal tunnel release, inguinal herniorrhaphy, appendectomy and cholecystectomy. Using the in-house databases of Alberta Health and Wellness and Ontario's Institute for Clinical Evaluative Studies, both partners in the research team, procedure volumes were calculated and assigned a residence category as detailed below. Characteristics of surgical providers and capabilities of RSPs were also determined as outlined below.

Data analysis

Databases

Alberta

- Discharge Abstract Database (DAD)
- Ambulatory Care Classification Systems
- Alberta Health Care Insurance Plan

Ontario

- DAD
- Same Day Surgery
- Registered Persons Database

Data extraction criteria — identifying the index procedures

The 4 index procedures represent a data set that is a subset of a companion study by the same research team (p. 195) that compared utilization rates between urban and rural Canadians over the same time period. The detailed description of the methodology developed to identify the relevant procedures can be found in that paper.[5]

Data extraction criteria – physicians

Canadian-certified general surgeons were identified using Canadian Institute for Health Information's (CIHI) data service codes 30. Family practice (FP)

surgeons were defined by CIHI service codes 01 (family practitioner) and 07 (general practitioner).

Within the Alberta physician population, we identified the FP surgeons who performed cholecystectomy as representatives of a cohort within the FP surgeons group who would have an advanced level of surgical training, usually a foreign fellowship (referred to as foreign-trained general surgeon). When laparoscopic techniques were introduced in rural Alberta in the early 1990s, the College of Physicians and Surgeons of Alberta restricted privileges in the new technology for rural non-certified surgeons to foreign-trained general surgeons (Dr. Trevor Theman, then Assistant Registrar, College of Physicians and Surgeons of Alberta: personal communication, 2003). No similar methodology is available to identify the non-specialist surgeons in Northern Ontario who have an advanced level of training.

Analysis was restricted to physicians who submitted at least 3 claims for any of the 4 procedures. This specification reflects the fact that the database contained a large number of non-specialist physicians submitting claims for only 1 or 2 surgical procedures. This could represent either data errors or, possibly, physicians entering or leaving at the end or beginning of the study period.

Definition of "rural"

A patient was identified as "rural" if he or she had a non-urban postal code. We defined a non-urban postal code to be 60 min drivetime from a Metropolitan centre or 30 min from a Regional centre. A Metropolitan centre was defined as a tertiary care centre with a local medical school; there were no Metropolitan centres in Northern Ontario at the time of the study.

A hospital was considered "rural" if the procedural care was provided without a significant specialist presence (>2) outside of general surgery. This draws on earlier work in the literature.[6]

For more on the definitions of rural, and our rationale, the reader is referred to the companion study (p. 195) on utilization rates[5] and a third paper by Ellehoj and coworkers (p. 187).[7]

Level of surgical services

Hospital catchment areas

All of the acute care facilities in both Alberta and Northern Ontario were assigned to a unique catchment area so that each patient undergoing a procedure could be identified as "belonging" to the catchment area of one, and only one, of the hospitals, regardless of where the procedure was performed. The methodology to create these carchment areas is described in the paper by Ellehoj and coworkers.[7]

Each of the acute care facilities was then organized into 1 of 5 levels of surgical services categories: Metropolitan, Regional or Rural A, B or C (Appendix 1).The Rural A hospitals represent RSPs with at least one Canadian-certified general surgeon on the local medical staff. The Rural B hospitals represent RSPs staffed by non-specialist surgeons with varying amounts of surgical training. The Rural C hospitals do not offer local surgical services. A more detailed description of the methodology to identify hospitals by level of surgical services can be found in the companion paper by Tepper and colleagues.[2] The boundary between Northern and Southern Ontario was defined by the French River.

Ethics approval was received from the Community Research Ethics Board of Alberta (Protocol 0410).

Results

Rural surgical programs: distribution, distance and provider types

Figure 1 and Figure 2 show the RSPs in Northern Ontario and Alberta. Table 1 summarizes both the distribution of the RSPs and the average size of the catchment areas they serve. The major difference between provinces is that Alberta has 27 Rural B RSPs and Northern Ontario has only 4.

There are significant differences in both provinces between the catchment areas of Rural C communities (approx. 5000 pop.), which do not have local RSPs, and Rural A and B communities (10 000–12 000 pop.), which do. The surgical programs staffed by specialist surgeons (Rural A) serve, on average, a larger population (Alberta: 12 038; Northern Ontario: 11 087) compared with programs (Rural B) served by non-specialist surgeons (Alberta: 9554; Northern Ontario: 9385). Although this difference is significant ($p < 0.05$), there is considerable overlap between the distribution of catchment area size for Rural A and Rural B programs.

Table 2 shows the distance to the next higher level of care for the Rural A and Rural B programs. Rural Alberta (12) and Northern Ontario (10) have a similar number of RSPs staffed by Canadian-cer-

tified general surgeons. These represent 14 specialist surgeons in rural Alberta and 16 in rural Northern Ontario. There are significant provincial differences at the Rural A and Rural B level in the provision of surgical services by foreign-trained general surgeons and FP surgeons. Although Alberta has 16 foreign-trained general surgeons and 43 FP surgeons who performed appendectomies during the 5-year study period, Northern Ontario has less than 6 non-certified surgeons performing this procedure.

In Table 3, provider types for the 4 procedures for rural Albertans are identified. The delivery system is dominated by Canadian-certified general surgeons, for the most part working in urban referral centres that provide between 70%–90% of services (except for carpal tunnel release) to rural patients. Within Rural B communities, the proportion of surgical cases performed by foreign-trained general surgeons increases to 37% (appendectomy), 36% (carpal tunnel release), 11% (cholecystectomy) and 28% (herniorrhaphy).

The proportion of procedures performed by non Canadian-certified general surgeons are also higher in those rural communities (Rural A) served by Canadian-certified general surgeons; 25% (appendectomy), 28% (carpal tunnel release), 20% (cholecystectomy) and 21% (hernias). This reflects what we have found in other studies.[4] These non-specialist surgeons play a strategic role in collaborating and sharing on-call duties in communities where there is a specialist surgeon.

Volume of procedures

Physicians in the non-specialist RSPs in both provinces perform low volumes of the index surgical procedures (Table 4). For example the physicians in the Rural B programs perform, on average, 6 appendectomies per year. This contrasts with 15–18/yr in the Rural A centres and more than 100 in the Regional centres.

Table 5 shows the volumes of the different surgery providers during the 5-year study period. One hundred and forty-five Canadian-certified general surgeons provided appendectomy services to rural Albertans, with a mean number of procedures per physician of 90 (18/yr). This represents both the surgical procedures provided locally by the Canadian-certified general surgeons[14] located in the Rural A communities and the procedures provided by Canadian-certified general surgeons in the referral centres where residents have had to travel for care. This contrasts with only 16 foreign-trained general surgeons (mean number of procedures = 31) and 43 FP surgeons (mean number of procedures = 21 (Table 5). The low volumes for both foreign-trained general surgeons and FP surgeons translate

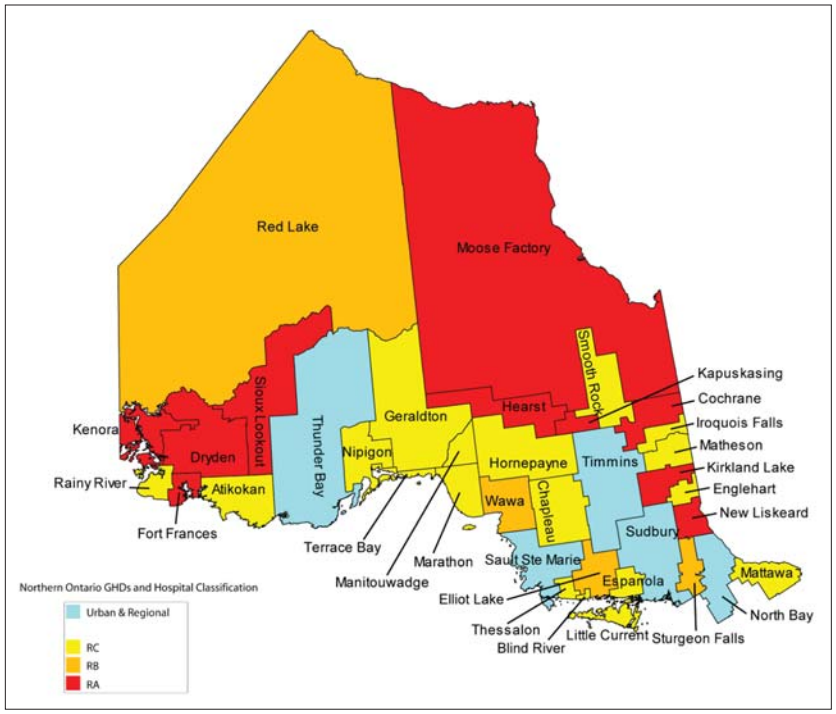


Fig. 1. Rural surgical programs, Northern Ontario, by level of service. RC = Rural C, RB = Rural B, RA = Rural A. GHD = General Hospital Districts. See "Level of Surgical Services" in text for descriptions.

into approximately 6 and 4 procedures per year, respectively. Our data do not allow us to measure the volumes of the Canadian-certified general surgeons working in rural Alberta. An earlier study found that rural general surgeons averaged 15 appendectomies per year.[6]

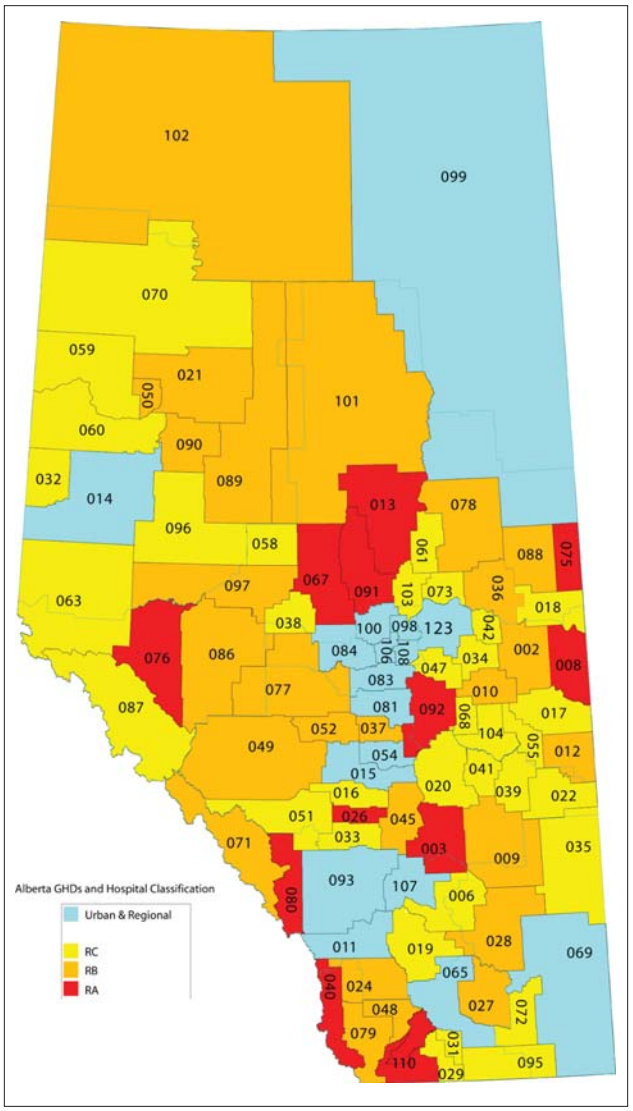


Fig. 2. Rural surgical programs, Alberta, by level of service. GHD = General Hospital Districts. RC = Rural C, RB = Rural B, RA = Rural A. See text for descriptions of categories. See Appendix 1 for definition of each number.

Outflow of cases

At least a portion of the Rural B RSPs in both Alberta and Northern Ontario appears to have some success in keeping a significant portion of their surgical services within their local facility (although the numbers are very small in Northern Ontario) (Table 6). However, there is considerable variation in outflow from these programs; outflow is measured as the proportion of local residents travelling to a facility that provides a higher level of care for their surgical procedure (Fig. 3, Fig. 4). Outflow does not appear to be influenced by distance to a larger surgical program.

There are significant provincial differences between the RSPs staffed by Canadian-certified specialist surgeons (i.e., Rural A). The Northern Ontario RSPs succeed in keeping almost all of the low to medium complexity surgeries within their own facilities. This contrasts with Alberta, where approximately 25% of these procedures are performed elsewhere (Table 6).

Discussion

Rural Alberta and Northern Ontario have developed different approaches to the problem of providing rural surgical care. In Alberta they have adopted a decentralized model of a large number of small-volume programs delivered by some Canadian-certified general surgeons but often assisted or replaced by foreign-trained general surgeons or FP surgeons. Northern Ontario has developed a system that relies almost exclusively on Canadian-certified general surgeons.

Table 1. Surgical services and population for Alberta and Northern Ontario

	Rural A*		Rural B†		Rural C‡	
Variable	Alberta	Northern Ontario	Alberta	Northern Ontario	Alberta	Northern Ontario
No. of facilities	12	10	27	4	40	18
Population over the age of 5 yr	144 455	110 872	267 981	48 742	203 088	89 823
Average population per facility§	12 038	11 087	9 554	9 385	5 077	4 990

*Rural A hospitals represent RSPs with at least 1 Canadian-certified general surgeon on medical staff.
†Rural B hospitals represent rural surgical programs (RSPs) staffed by non-specialist surgeons with varying amounts of surgical training (i.e., no Canadian-certified general surgeons on staff).
‡ Rural C hospitals do not offer local surgical services.
§Catchment area population (age >5 yr).

The reasons for these differing approaches may reflect geographical, historical, licensing, training and political considerations. For example, when compared with Alberta, Northern Ontario's rural population is smaller and is more concentrated in larger centres. Furthermore the rules governing the provision of a license to IMGs is different in the 2 provinces.

There are arguments for and against either approach. It is possible that the optimal approach (i.e., the approach that provides the highest quality surgical care to the maximum number of people in the most cost effective fashion) would be some combination of the 2 systems. However, the relatively stark differences between the 2 provinces provides an opportunity to compare the 2 approaches.

The decentralized approach to surgical care in Alberta allows the maximum numbers of patients to

Table 2. Travel distance and travel time to next higher level of care for Rural A and Rural B

	No. of facilities in each services category			
	Rural A to Regional or Metropolitan		Rural B to Rural A	
Travel distance (travel time)	Alberta	Northern Ontario	Alberta	Northern Ontario
<80 km (<1 h)	3	–	8	1
80–160 km (1–2 h)	6	3	11	1
>160 km (>2 h)	3	7	7	2

Table 3. Surgical procedures for rural Alberta,* by physician provider type

	Type of physician provider, no. of procedures performed (and %)†			
Surgical procedure	Canadian-certified general surgeons *n* = 145	Foreign-trained general surgeons *n* = 16	Family practice surgeons *n* = 43	Other‡
Appendectomy	2 618 (70)	330 (9)	714 (19)	71 (2)
Carpal tunnel release	1 231 (23)	479 (9)	1 012 (19)	2 727 (50)
Cholecystectomy	7 791 (88)	1 069 (13)	–	13 (0)
Herniorrhaphy	9 384 (76)	1 275 (10)	1 308 (11)	365 (3)

*A similar analysis for Northern Ontario is precluded by the small numbers of non-certified surgeons.
†Percentages have been rounded.
‡Represents physicians with a specialty designation other than general surgery. The number of physicians in this group is not significant.

Table 4. Procedure volumes per year, per rural facility

	Type of facility,* volume of procedures					
	Rural A		Rural B		Regional	
Surgical procedure	Alberta	Northern Ontario	Alberta	Northern Ontario	Alberta	Northern Ontario
Appendectomy	15.4	17.7	6.7	5.8	138.0	104.8
Carpal tunnel release	16.2	15.4	8.7	9.7	82.6	165.2
Cholecystectomy	45.1	47.4	6.3	8.6	314.6	321.4
Herniorrhaphy	31.2	20.5	10.5	13.7	168.1	175.8

*Rural C facilities do not offer local surgical services.

Table 5. Procedure volume for selected surgical procedures, for rural Alberta,* by physician provider type

	No. of physicians (mean no. of procedures per physician)			
Surgical procedure	Canadian-certified general surgeons	Foreign-trained general surgeons	Family practice surgeons	Other†
Appendectomy	145 (90)	16 (31)	43 (21)	6 (125)
Carpal tunnel release	53 (50)	12 (58)	38 (34)	105 (37)‡
Cholecystectomy	146 (236)	18 (91)	–	8 (9)
Herniorrhaphy	157 (283)	17 (112)	48 (37)	82 (28)

*A similar analysis for Northern Ontario is precluded by the small numbers of non-certified surgeons.
†Represents physicians with a specialty designation other than general surgery.
‡Plus 38 plastic surgeons (38).

receive surgical care within their own community. Not only are the purely surgical services maintained in the community, but there is evidence that local maternity programs do not survive the loss of a surgical program that can provide a Cesarean section. There is further evidence that women who are obliged to travel for maternity care have poorer outcomes.[8,9] Additionally, eliminating small RSPs may have negative consequences for the provision of emergency or trauma services. RSPs and, by extension, small rural hospitals may play an important role in the economic development and the sustainability of rural communities.[10]

Although the number of procedures per facility and per surgical provider are small — particularly for the Rural B facilities, there is no compelling evidence in the literature to suggest that for these relatively small, low-intensity procedures there is any negative impact on outcome. Indeed there are a few studies, including one larger study,[11,12] that compared the outcomes of appendectomies performed in these rural hospitals by specialist and non-specialist surgeons. For 4587 appendectomies performed over 3 years in rural hospitals in Western Canada and Ontario the average volumes for provider types are similar to our study.[12] Most outcome measures (i.e., mortality, length of stay, death, diagnostic accuracy rate and transfer rate) were similar between specialist and non-specialist surgeons. Patients operated on by specialist surgeons were older and were more likely to have perforations and require a return to the operating room.

Table 6. Surgical procedures for residents of rural communities with local surgical programs

	No. (and %) of procedures			
	Rural A		Rural B	
Surgical procedure	Alberta	Northern Ontario	Alberta	Northern Ontario
Appendectomy	547 (69)	667 (93)	664 (38)	87 (31)
Carpal tunnel release	611 (75)	670 (83)	801 (57)	166 (47)
Cholecystectomy	1410 (73)	1750 (91)	624 (17)	370 (36)
Herniorrhaphy	1044 (77)	881 (91)	1094 (47)	247 (66)

Sources for Alberta: Discharge Abstract Database (DAD), Ambulatory Care Classification Systems database; sources for Northern Ontario: DAD, Same Day Surgery database.

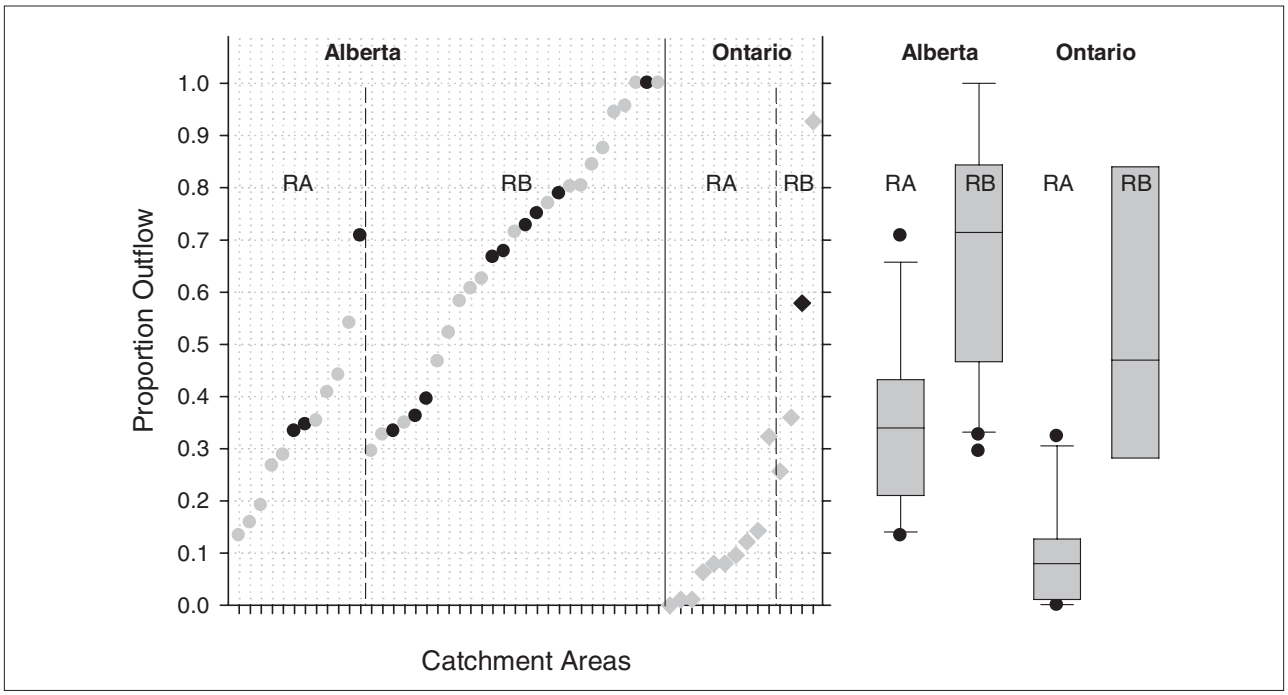


Fig. 3. Appendectomy. Outflow to higher level of care. Box plots represent medians, 25% and 75% ranges, and outliers. Black represents rural surgical programs within 1 hour of a higher level of care. Grey represents more isolated programs. RA = Rural A, RB = Rural B. See text for description. "Ontario" represents Northern Ontario.

Obstetrics literature provides additional information on cesarean sections performed by rural family physicians. There is evidence of safe outcomes in cesarean sections associated with practitioner volume of relatively few[5–23] cases.[13]

A regional approach, such as the one undertaken in Northern Ontario, permits the concentration of surgical services in centres with sufficient volumes to optimize the use of surgical providers. Although there are no published data at the present time to suggest a negative impact on outcome of small volumes, there is a concern that low-volume centres and surgeons may compromise results.[14] Certainly one can argue that a centre that performs ≤10 of each of the study procedures (Rural B programs) might not sustain competence or confidence in the multiple surgical providers in these institutions. In addition it is unlikely that they would be cost efficient. The marginal cost of providing each of these procedures is certain to be high because of the high fixed cost of maintaining the surgical infrastructure of a staffed operating room.

The justification for small-volume centres might be compromised by proximity to a higher level of care. In Alberta 8 small programs are within a 1-h drive and 11 more are within a 2-h drive of a larger surgical centre. Many of these small-volume programs do not capture a large proportion of the clinical surgical cases. The median outflow for Rural B programs is slightly greater than 60% for herniorrhaphy and 70% for appendectomy (Fig. 3, Fig. 4) It is possible that the programs with the largest outflow might not be sustainable or necessary. In a longitudinal study in the United States, small-volume obstetrical programs with outflows >67% were at high risk of closing.[9] There is published evidence on small-volume outcomes in the obstetrical literature. Two consensus reports from the Society of Obstetricians and Gynaecologists of Canada, the Society of Rural Physicians of Canada and the College of Family Physicians of Canada reviewed the relevant published literature and concluded that these programs provide safe outcomes. More importantly, populations served by rural hospitals that do not offer local maternity care seem to have worse outcomes.[15,16] Recently, a large population study from Germany suggests that low-volume obstetric centres have significantly higher perinatal mortality than the high-volume centres.[17] In a system where all deliveries are performed either by midwives or obstetricians and where even the smallest hospitals have staff obstetricians, the relevance of this study to rural Canada is uncertain.

US data show that, for 9 specialized surgeries, better outcomes occur in larger volume centres.[18] In a Canadian study that attempted to replicate these findings only 3 of 9 highly specialized surgeries showed improved outcomes for high-volume centres. None of these 3 surgeries were performed in rural Canada.[16,18]

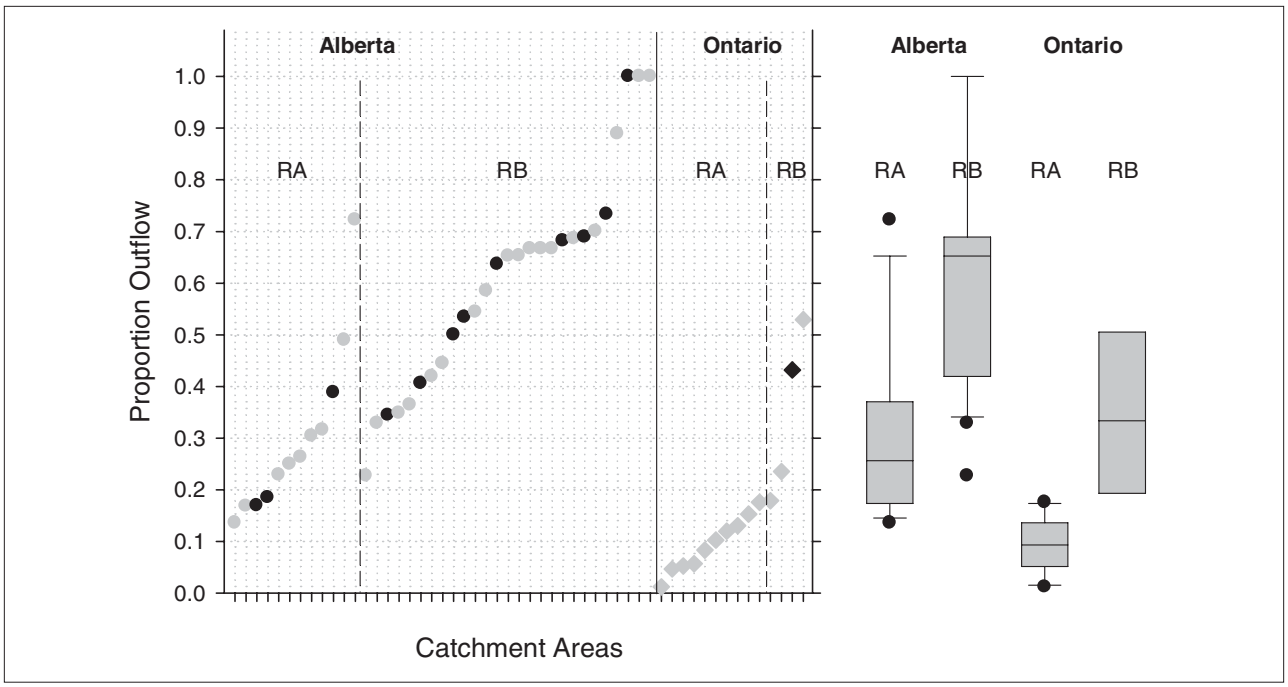


Fig. 4. Herniorrhaphy: Outflow to higher level of care. Boxplots represent medians, 25% and 50% ranges, and outliers. Black represents rural surgical programs (RSPs) within 1 hour of a larger surgical program. Grey represents more isolated RSPs. RA = Rural A, RB = Rural B. See text for description. "Ontario" represents Northern Ontario.

It is an inefficient use of scarce surgical skills to use trained surgeons so infrequently. There is a well documented shortage of general surgeons in Canada, which is likely to worsen — especially in rural Canada.[19–21] General surgery is a career that is increasingly viewed as non-desirable by graduating students.[22] If we are to attract residents to rural or community surgical practice we must provide conditions of a reasonable lifestyle without excessive call and adequate resources to promote a productive surgical practice. In Northwestern Ontario recruitment has been improved with the development of the Northwest Ontario Surgical Network.

It is important to distinguish between FP surgeons and the foreign-trained general surgeon. The former are primarily family physicians doing occasional surgery, and the latter are primarily trained surgeons doing some family practice. It is possible that the subpopulation of IMG physicians with foreign fellowships (i.e., foreign-trained general surgeons) achieve better outcomes than others with less training (FP surgeons). Many of the foreign-trained general surgeons have additional skills in orthopedics, urology, obstetrics and other specialties that enable them to provide a broader range of services appropriate to regional community care.

It is possible that the FP surgeons do provide important backup and call coverage for the Canadian-certified surgeons. Certainly this is a role suited to the foreign-trained general surgeons. However, the limited skill set and the small volumes of the FP surgeons restrict their ability to provide this on-call relief for the specialist surgeons.

The position of the Canadian Association of General Surgeons remains steadfast that entering the peritoneal cavity, as in appendectomy and inguinal hernia repair, should remain the responsibility of fully trained general surgeons. They strongly believe that appendicitis remains an elusive diagnosis that can be mimicked by many more serious conditions well beyond the scope of practice of someone with only one year of surgical training.[23]

There is a significant difference between the outflows in the Rural A programs in Northern Ontario and Alberta. It is unclear to us why the Northern Ontario programs are so successful at capturing almost all of their surgical caseload. Possibly, they are more remote (7 of 10 are more than 2 hours from a referral centre in Northern Ontario compared with 3 of 12 in Alberta). Possibly, there might be differences between the programs with anesthesia, nursing, and locum coverage where full surgical coverage is not always available. Finally, these differences might reflect the preferences of more Alberta patients to travel to larger centres for surgical care.

The present study is handicapped by a lack of outcome data on the populations studied that would facilitate the design of surgical care delivery. Further research might or might not demonstrate important differences in the 2 systems.

Ultimately, although different provinces may adopt different general approaches, there is not a single system that will satisfy the needs of all rural residents and communities. The challenge for provincial health departments, manpower planners and national specialty societies is to design, advocate and implement a system that provides safe, surgical care for all Canadians regardless of residence.

Limitations

There is an important limitation in our methodology: we identified non-specialist physicians with foreign fellowships by their performance of laparoscopic cholecystectomies. Although it is true that all the providers of these procedures in rural Alberta do have either a Canadian or a foreign fellowship, the converse is probably not true. That is, among the FP surgeons, there will be some who do possess a foreign fellowship but who, for reasons related to local hospital resources or personal training, chose not to retrain and retool after the introduction of laparoscopic cholecystectomy. In addition, it is possible that over a 5-year period, the characteristics of local RSPs might have changed between our Rural A, Rural B and Rural C classification.

Additionally, we have assumed that all cholecystectomies have been done laproscopically. A very small proportion of cholecystectomies are still performed by open technique. Our failure to include this distinction might in some way bias our findings.

Conclusions

There are 3 major differences between Alberta and Northern Ontario in the delivery of surgical services to their rural populations. First, Alberta has more small RSPs. It is possible that this reflects significant differences in the distribution of the rural population within the 2 provinces. The community hospitals in Alberta draw on larger catchment areas because of the agricultural population residing outside organized towns, villages and hamlets. It may also reflect a different public policy/philosophy with respect to surgical care delivery in the 2 provinces. Second, the delivery of RSPs in Alberta relies heav-

ily on the supply of non-specialist surgical staff. Third, the RSPs staffed by specialist surgeons in Northern Ontario are significantly more successful in retaining almost all of the local surgical caseload within their community.

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Appendix 1. Facility classifications for Alberta and Northern Ontario

Province, classification, map number*	Location	Population	Distance to next highest level of care, km
Alberta, Rural A			
013	Athabasca	8 872	140
067	Barrhead	11 325	110
040	Blairmore	6 462	150
092	Camrose	24 037	70
080	Canmore	10 441	90
110	Cardston	8 906	60
075	Cold Lake	12 945	300
003	Drumheller	11 185	135
076	Hinton	10 816	280
008	Lloydminster	17 445	250
026	Olds	9 467	68
091	Westlock	12 554	85
Alberta, Rural B			
071	Banff	8 111	48
088	Bonneyville	12 254	100
028	Brooks	18 033	110
024	Claresholm	5 585	100
077	Drayton Valley	22 741	140
086	Edson	13 044	80
048	Fort Macleod	5 917	48
050	Grimshaw	4 799	170
009	Hanna	5 031	86
102	High Level	7 718	450
089	High Prairie	10 087	200
078	Lac la Biche	8 813	250
090	McLennan	4 549	200
021	Peace River	10 739	250
079	Pincher Creek	8 291	60
037	Ponoka	9 932	60
012	Provost	3 942	120
052	Rimbey	6 101	65
049	Rocky Mountain House	14 451	90
101	Slave Lake	8 881	320
036	St. Paul	15 224	100
027	Taber	13 567	50
045	Three Hills	9 726	100
002	Vermillion	8 586	60
010	Viking	2 472	85
097	Whitecourt	9 969	110
017	Wainwright	9 394	105
Northern Ontario, Rural A			
	Cochrane	6 441	90
	Dryden	14 893	340
	Fort Frances	12 268	335
	Hearst	8 146	260
	Kapuskasing	12 101	165
	Kenora	18 332	205
	Kirkland Lake	12 447	140
	Moose Factory	5 805	270
	New Liskeard	15 106	150
	Sioux Lookout	5 343	370
Northern Ontario, Rural B			
	Wawa	5 811	225
	Elliot Lake	14 207	160
	Red Lake	12 445	270
	Sturgeon Falls	16 279	37

*See Fig. 2 for Alberta map numbers. Map for Northern Ontario (Fig. 1) does not include map numbers.