Original Article

Surgery in the western Canadian Arctic: The relative impact of family physicians with enhanced surgical skills working collaboratively with specialist surgeons

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Abstract

Introduction: Little is known about the surgical needs of rural, remote or circumpolar populations in Canada; these same regions are also home to half of all Indigenous people in the country. In the present study, we sought to understand the relative impact of family physicians with enhanced surgical skills (FP-ESS) and Specialist Surgeons in the surgical care of a mostly Indigenous rural and remote community in the western Canadian Arctic.

Methods: A descriptive and retrospective quantitative study was conducted to determine the number and range of procedures performed for the defined catchment population of the Beaufort Delta Region of the Northwest Territories, as well as the type of surgical provider and location of that service, over the 5 years from 1 April, 2014, to 31 March, 2019.

Results: FP-ESS physicians in Inuvik performed 79% of all endoscopic and 22% of all surgical procedures, which accounted for nearly half of the total procedures performed. Over 50% of all procedures were performed locally (47.7% by FP-ESS and 5.6% by visiting specialist surgeons). For surgical cases alone, nearly one-third were performed locally, one-third in Yellowknife and the remaining one-third out-of-territory.

Conclusions: This networked model reduces the overall demand on surgical specialists, who can better focus their efforts on surgical care that is beyond the scope of FP-ESS. With nearly half of the procedural needs of this population being met locally by FP-ESS, there are decreased health-care costs, better access and more surgical care closer to home.

Keywords: Family physicians with enhanced surgical skills, rural medicine, rural specialists, specialist surgeons, surgery

Résumé

Introduction: On connaît peu les besoins en chirurgie des populations rurales, éloignées ou circumpolaires du Canada; ces mêmes régions abritent également la moitié de tous les peuples autochtones du pays. Dans la présente étude, nous

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avons cherché à comprendre l'impact relatif des médecins de famille ayant des compétences chirurgicales améliorées (FP-ESS) et des chirurgiens spécialistes dans les soins chirurgicaux d'une communauté rurale et éloignée principalement autochtone dans l'Arctique canadien occidental.
Méthodes: Une étude quantitative descriptive et rétrospective a été menée pour déterminer le nombre et l'éventail des procédures effectuées pour la population desservie définie de la région du delta de Beaufort des Territoires du Nord-Ouest, ainsi que le type de fournisseur de services chirurgicaux et le lieu de ce service; sur une période de 5 ans allant du 1er avril 2014 au 31 mars 2019.
Résultats: Les médecins de la FP-ESS à Inuvik ont effectué 79% de toutes les procédures endoscopiques et 22% de toutes les procédures chirurgicales, ce qui représente près de la moitié du total des procédures effectuées. Plus de 50% de toutes les procédures ont été effectuées localement (47,7% par la FP-ESS et 5,6% par des chirurgiens spécialistes en visite). Pour les cas chirurgicaux seulement, près d'un tiers ont été effectués localement, un tiers à Yellowknife et le dernier tiers à l'extérieur du territoire.
Conclusions: Ce modèle en réseau réduit la demande globale de spécialistes en chirurgie, qui peuvent mieux concentrer leurs efforts sur les soins chirurgicaux qui ne relèvent pas de la compétence de la FP-ESS. Comme près de la moitié des besoins procéduraux de cette population sont satisfaits localement par la FP-ESS, les coûts des soins de santé diminuent, l'accès est amélioré et les soins chirurgicaux sont plus proches du domicile.

Mots clés: Chirurgie, spécialistes ruraux, chirurgiens spécialisés, médecins de famille aux compétences chirurgicales renforcées, médecine rurale

INTRODUCTION

Little is known about the surgical needs of rural, remote or circumpolar populations in Canada; these same regions are also home to half of all Indigenous people in the country.[1,2] In 2015, the Truth and Reconciliation Commission (TRC) of Canada established a list of 94 Calls to Action 'to redress the legacy of residential schools and advance the process of Canadian reconciliation'.[3] Seven of these relate to healthcare for Indigenous Canadians. While none of them refers to surgical care specifically, Call to Action 19 calls upon 'the federal government, in consultation with Aboriginal peoples, to establish measurable goals to identify and close the gaps in health outcomes between Aboriginal and non-Aboriginal communities…'.[3] One step in closing this gap and improving surgical outcomes is to better understand the burden of surgical disease and how current models of service delivery meet those needs.

For remote populations too small to support local specialist surgeons, surgical care can be delivered by itinerant specialist surgeons, community family physicians with Enhanced Surgical Skills (FP-ESS) and/or by transferring all cases to referral hospitals.[4-6] In the Beaufort Delta Region, (BDR) Northwest Territories, surgical care is provided by integrating these three options in an informal networked model. The FP-ESS physicians in the community provide consistent coverage, continuity of care and interact with and are supported by visiting surgeons from obstetrics and gynaecology, general surgery, otolaryngology and orthopaedic surgery. For cases too complex to be performed locally and/or which require other surgical specialities, patients must travel by air to the secondary (Yellowknife; 1103 km from Inuvik) or tertiary level (Edmonton; 922 km from Yellowknife) hospitals. Further details about this networked model for surgical care and the working relationship between FP-ESS and specialist surgeons can be found in our recent publication.[7]

In the present study, we sought to understand which surgical procedures were performed by which type of surgical provider, at each level of the health-care system for any Beaufort Delta resident from 1 April, 2014 to 31 March, 2019. With this data, we intend to demonstrate the relative impact of each of the surgical specialities, as well as that of FP-ESS, on the overall surgical care for this population. To our knowledge, this perspective of a rural surgical system in a circumpolar and mostly Indigenous region, has never been demonstrated in the literature.

METHODS

A descriptive and retrospective quantitative study was designed to determine the number and range of procedures performed for the defined catchment

population of the Beaufort Delta Region of the Northwest Territories (6931 people), as well as the type of surgical provider and location of that service, over the 5 years from 1 April, 2014 to 31 March 2019. This study was conducted within a larger mixed methods project focused on programme planning and evaluation;[8] only the quantitative findings are reported in this paper.

Given inaccuracies identified in a preliminary review of the data held within the territorial Human Resources Information System (HRIS), and the challenges in extracting the required data from that source, the study was limited to the procedure data contained within the Discharge Abstract Database and the National Ambulatory Care Reporting Service of the Canadian Institute for Health Information (CIHI).[9]

Inclusion/exclusion criteria

All residents of the Beaufort Delta Region, with a postal code from one of its eight communities, who underwent a surgical procedure were included in the data request to CIHI. Non-residents (primary residents outside of the BDR) were excluded. To prevent inadvertent reidentification of patients from a relatively small data set, community of origin and patient's age could not be released. Procedures were broadly defined as any endoscopic procedure of the gastrointestinal tract or any surgical procedure performed in the operating theatre (day surgery or in-patient). Surgical providers were defined as either FP-ESS or specialist surgeons (i.e.: Cardiovascular/thoracic surgery, general surgery, neurosurgery, obstetrics/gynaecology, ophthalmology, orthopaedic surgery, otolaryngology, plastic surgery, urology, vascular surgery, dental/oral surgery and the paediatric surgical subspecialties) or gastroenterologists. The only other providers included in our analysis were interventional radiologists as they perform procedures which would otherwise require an operation. The locations where procedures were performed were defined as Inuvik (Inuvik Regional Hospital), Yellowknife (Stanton Territorial Hospital) or out-of-territory. Most out-of-territory services are provided at any of several hospitals in Edmonton, Alberta, but some patients received care elsewhere in Canada. After reviewing the raw dataset from CIHI, procedures were excluded if they were not surgical in nature (supportive care such as intubations and central line placements) or if they were provided by non-surgeons.

Data analysis

The raw dataset from CIHI was imported into Microsoft Excel; data cells were grouped by region and type of surgical provider, then counted individually by procedure performed. CIHI databases record procedures using codes based on the Canadian Classification of Health Interventions (CCI). Each of these procedure codes had to be decoded to a commonly recognised procedure name. These data were then entered into a summary table and the total numbers of procedures by provider type and region were calculated. These totals were then used to generate pie charts demonstrating the proportion of all combined procedures (surgical procedures and GI endoscopy), all surgical procedures, and all gastrointestinal endoscopies by the surgical provider and by region; a bar graph was also created to demonstrate the proportion of types of procedures (endoscopy, general surgical, gynaecologic-obstetrical or of other surgical specialities) performed by FP-ESS relative to those respective specialist surgeons. When fewer than 5 of a given procedure were performed over the 5-year study period, that procedure was included in a more general category (for example, specific lower extremity fractures were counted within a category 'other lower extremity fractures' rather than by the specific bone and type of fracture).

During an initial review of HRIS data, examples were found of incorrect specialists doing a procedure (for example, a paediatrician performing gynaecological surgery; a neurosurgeon was listed as doing a vascular procedure normally done by a general surgeon). Within the data reviewed from CIHI databases, most laparoscopic cholecystectomies performed in Inuvik were coded as being done by family physicians instead of by general surgeons (CIHI does not include a category for FP-ESS). When it was obvious which type of provider would have performed a given surgery, that provider was substituted for the one listed. When there was a cross-over in provider competencies, the provider listed in the original dataset remained the provider

for that procedure. An example would include carpal tunnel release; during the study period, all in Inuvik were listed as being performed by FP-ESS. Without cross-referencing data by accessing patient charts, there would be no way to determine which if any of those procedures were performed by a visiting orthopaedic surgeon.

Ethics

Research Ethics Board approval was granted from the University of British Columbia and from Aurora College; a research license was obtained from the Aurora Research Institute; a Research Agreement was obtained through the Research Coordinator at the Department of Health and Social Services for permission to approach staff of the Northwest Territories Health and Social Services Authority.

RESULTS

The extracted summary data were first categorised according to which type of surgical care provider (FP-ESS or specialist) was delivering which proportion of procedures. Second, we examined where these procedures were performed across the surgical system. Third, given the overlap in the scope of practice of FP-ESS with general surgery, obstetrics/gynaecology, and gastroenterology, we compared the proportion of those types of procedures by the surgical provider. Finally, we determined the five most common surgical procedures by type of surgical provider at each of the three levels of the surgical system.

FP-ESS and Specialist surgeons (total proportions)

FP-ESS physicians provided 47.7% of the total surgical and endoscopic procedures performed for the catchment population over the 5-year study period; all such procedures were performed at the Inuvik Regional Hospital. Surgical specialists performed 52.3% of the total number of procedures in all locations, including Inuvik, Yellowknife and out-of-territory [Figure 1].

In terms of surgical procedures, FP-ESS performed 21.9%, while specialist surgeons, whether in Inuvik, Yellowknife or out-of-territory, performed the majority (78.1%) of procedures.

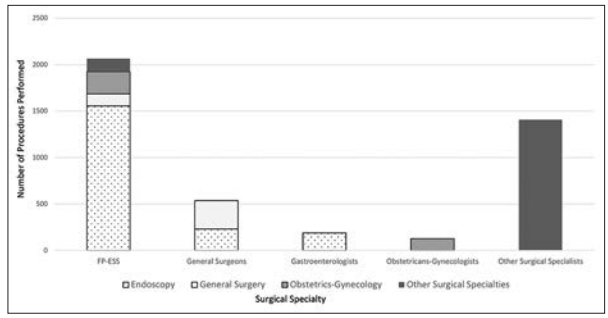


Figure 1: Proportion of surgical procedures by most responsible surgical provider. each bar represents the type of surgical provider; procedures are coded by type (endoscopy, general surgery, obstetrics-gynaecology and other surgical specialities) to demonstrate the relative proportion of each type provided by FP-ESS and relative to the total for that speciality. For example, obstetrics-gynaecology procedures constituted 11.5% of the total procedures performed by FP-ESS, but FP-ESS accounted for 65.2% of all of the obstetrics-gynaecology procedures performed over the study period. FP-ESS: Family physicians with enhanced surgical skills.

For all endoscopic procedures, FP-ESS did 78.7%, while general surgeons and gastroenterologists did 12.1% and 9.2%, respectively).

Proportions by region

When considering the total proportion of procedures by region, more than half of all procedures (53.1%) were performed locally in Inuvik; 25.7% and 19.3% were performed in Yellowknife or out-of-territory, (Hay River 2%), respectively.

For surgical procedures, these proportions were 31.2% (Inuvik), 35.6% (Yellowknife), and 29.7% (out-of-territory), while the endoscopic procedures were predominantly done in Inuvik (79.2%), with only 14% and 6.8% done in Yellowknife and out-of-territory, respectively).

Proportion of procedures by family physicians with enhanced surgical skills and by speciality

The procedures performed by FP-ESS are broken down by type of procedure, grouped as endoscopy, general surgery, obstetrics/gynaecology and others [Figure 1]. The groupings were done to reflect the scope of practice of FP-ESS physicians working in the region but also to allow a comparison of the relative contribution of FP-ESS compared with specialist surgeons in surgical care within each of those traditional

fields. Endoscopy accounted for most of the procedures performed by FP-ESS (75.4%). When considering the volume of surgical procedures, 46.9% of the procedures performed by FP-ESS were obstetrics-gynaecology cases and 25.4% were general surgery cases, with those making up 65.2% and 29.7% of the total procedures within each of those specialities, respectively.

Most Common procedures by type of surgical provider

Table 1 lists the five most common procedures performed by a given surgical provider at each of the three levels of the health-care system for residents of the Beaufort Delta: Inuvik, Yellowknife and out-of-territory (most of which are in Edmonton).

DISCUSSION

For the mostly Indigenous population living in the Beaufort Delta Region over the 5-year study period, FP-ESS physicians in Inuvik performed 79% of all endoscopic and 22% of all surgical procedures, which accounted for nearly half of the total procedures performed for that population. FP-ESS performed 65% of the obstetrics-gynaecology procedures and almost 30% of the general surgical cases. While the FP-ESS scope of practice within any given surgical field is narrower than that of the respective surgical specialist, the fact that most ob-gyn procedures were performed by FP-ESS indicates that their narrower scope covers most ob-gyn cases in this region. This observation is consistent with published literature which states that the majority of surgical presentations should be manageable at the district, first-level hospital, a site at which the Essential and Emergency Surgical Care package should be available.[10,11] On the other hand, most general surgical procedures were performed by general surgeons, and not by FP-ESS, which suggests that many of the general surgical cases were too complex for the scope of FP-ESS. However, nearly 30% of those cases done by FP-ESS reduced the volume of surgical care that needed to be done by general surgeons within the system.

There is growing recognition of the importance of providing surgical care closer to home; this has been especially true for maternity care[12-14] and 'contributes to well-being, cultural continuity and kinship' for Indigenous communities.[15] Surgery closer to home not only improves access but also decreases the significant cost of medical travel in the Far North. Based on our data, more than 50% of all procedures were performed locally within the Beaufort Delta Region (47.7% by FP-ESS and 5.6% by visiting specialist surgeons), which also represented 80% of all endoscopic procedures and nearly one-third of all surgical cases. Another third of the surgical cases were performed in Yellowknife, and the remaining third out-of-territory. Ultimately, the local FP-ESS service stabilises the surgical services in this region, enabling continuous surgical backup for the maternity programme and supporting the other local rural generalist physicians. The service also increases the efficiency of the itinerant surgeons. Since FP-ESS are doing the common cases, the specialists are maximising their time by focusing on the more complicated cases. A further analysis of such datasets could also contribute to expanding surgical programmes within the Northwest Territories, thereby reducing medical travel costs and improving access closer to home.

Finally, the quality of surgical care and data on patient outcomes should be considered when determining the scope of surgical care in local hospitals. Unfortunately, in the data sources accessed, there were no morbidity and mortality data or other quality control measures available. In addition, rural surgical outcome data are challenging to obtain at the best of times because of both the small sample sizes and the lack of health information infrastructure to collect such data.[15] We acknowledge that the goal is high-quality surgery, wherever that surgery is performed. There exists a balance between access to surgical care close to home in a lower-resourced facility compared to the surgical care available in a high-resourced urban setting, but requiring long delays in definitive care and other challenges associated with travel.[16] Indigenous and non- Indigenous rural and remote communities should also be engaged, and their values incorporated into decision-making around how their services are provided.[17] The Rural Surgery and Obstetrics Network in British Columbia, Canada, is currently undergoing an evaluation phase and will soon provide outcome data where FP-ESS and specialist surgeons function collaboratively in a formal network.[18,19]

Table 1: Top 5 Most Common Procedures by Surgical Provider and by Level of the Surgical System

	Inuvik	Yellowknife	Out-of-Territory
FP-ESS	cesarean section tubal ligation/salpingectomy dilation & curettage herniorrhaphy appendectomy	N/A	N/A
General Surgery	cholecystectomy *	cholecystectomy appendectomy herniorrhaphy hemicolectomy laparotomy (any indication)	breast surgery cholecystectomy low-anterior resection appendectomy herniorraphy
Obstetrics-Gynecology	hysterectomy incontinence/prolapse surgery *	hysterectomy cesarean section adnexal surgery incontinence/prolapse surgery endometrial ablation	cesarean section *
Orthopedics	*	fracture fixation (arm, leg, other) knee arthroplasty knee arthroscopy hip arthroplasty ACL reconstruction	fracture fixation (arm, leg, other) back surgery hardware removal knee arthroplasty hip arthroplasty
Otolaryngology	tympanostomy tympanoplasty septo-rhinoplasty *	tympanoplasty tonsillectomy biopsies/excisions	*
Ophthalmology	N/A	cataract surgery *	retinal surgery eye lid surgery related to occular muscle *
Other Specialities	N/A	cystoscopy urethral dilation *	cystoscopy related to renal stones mandible fixation hand surgery pneumonectomy

This table lists the 5 most common procedures by the surgical provider and by the level of the surgical system (Primary - Inuvik, Secondary - Yellowknife, or Tertiary - Out-of-territory) for residents of the Beaufort Delta Region. *Other procedures were performed, but fewer than 5 of any of those other procedures were performed over the study period based on the data available from CIHI; Given the small datasets for a rural/remote population, these cannot be reported for reasons of privacy/confidentiality. CIHI: Canadian institute for health information, FP-ESS: Family Physicians with Enhanced Surgical Skill, N/A: Not available

Such formal networks are increasingly recognised as critical to high-quality rural surgery, maternity care and anaesthesia, also requiring adequate nursing and appropriate allied health professionals to function.

Limitations

The CIHI datasets used in this study depend on inputs from the NWT, which were known to have inaccuracies, as described in the Methods section. This issue would lead to an under or over-representation of procedures within some provider categories. The decoding of the CCI intervention codes into common procedure names could also have introduced error; this was likely at least in part mitigated by using more inclusive general categories to capture procedures.

The procedures included in this study are only those performed in the operating room (OR) or endoscopy suite and exclude minor procedures performed in the emergency room or outpatient setting. For example, a minor hand procedure done in the OR in Inuvik would be included in the data, while the same procedure done in an outpatient treatment room in Yellowknife or Edmonton

would be excluded. This would result in an overall under-representation of procedures, especially those performed in Yellowknife or out-of-territory relative to Inuvik. To more fully account for the burden of surgical conditions for the catchment population (which would include non-operative management) and the surgical activities of surgical care providers, consultations could have been included (this was the intent with the original study design, as both consultations and procedures represent the majority of surgical activities of any surgeon but was not possible given the state of the territorial health information systems).

Finally, in the present study, the surgical burden of the Beaufort Delta Region's population is only represented by those who underwent a surgical procedure and does not include any measurement of those who did not access care. Barriers to access healthcare are an important consideration for any population and are especially so given the historical and colonial context, which has negatively impacted Indigenous Canadians.

CONCLUSIONS

In summary, this networked model for the mostly Indigenous population living in the Beaufort Delta Region of the NWT includes community FP-ESS physicians and specialist surgeons based in Yellowknife and out-of-territory. Nearly half of the procedural needs of this population can be met by FP-ESS physicians, enabling better access and more care close to home, which in turn decreases costs to the health-care system. This model reduces the overall demand on surgical specialists, who can better focus their efforts on surgical care which is beyond the scope of FP-ESS. Similar models could aid in providing health administrators with a framework for future planning of sustainable surgical services in rural and remote settings. Through an improved understanding of the surgical needs of circumpolar Indigenous populations and of such models of surgical care delivery, where FP-ESS and specialist surgeons function collaboratively in a network, we hope to strengthen how surgical care can be delivered to rural and remote populations and to respond to the Calls to Action put forth by the TRC.

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Conflicts of interest: There are no conflicts of interest.

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