

Canadian Journal

of

# Rural Medicine

Journal canadien

de la

# médecine rurale



*The official journal of the Society of Rural Physicians of Canada*

VOLUME 11, NO. 3, SUMMER 2006

*Le journal officiel de la Société de la médecine rurale du Canada*

VOLUME 11, N° 3, ÉTÉ 2006

**IN THIS ISSUE**

**DANS CE NUMÉRO**

**Focus on Rural Surgery**



www.cma.ca/cjrm

**SCIENTIFIC EDITOR**  
**RÉDACTEUR SCIENTIFIQUE**  
JOHN WOOTON, MD  
Shawville, Que.

**ASSOCIATE SCIENTIFIC EDITORS**  
**RÉDACTEURS SCIENTIFIQUES ASSOCIÉS**  
GORDON BROCK, MD  
Temiscaming, Que.

MARTIN BENFEY, MD  
Fort-Coulonge, Que.

**MANAGING EDITOR**  
**DIRECTRICE DE LA RÉDACTION**  
SUZANNE KINGSMILL, BA, BSc, MSc  
Shawville, Que.

**ASSISTANT EDITORS**  
**RÉDACTEURS ADJOINTS**  
MIKE GREEN, MD  
Kingston, Ont.

STUART IGLESIAS, MD  
Gibsons, BC

MARY JOHNSTON, MD  
Revelstoke, BC

TRINA M. LARSEN SOLES, MD  
Golden, BC

ROBERT MARTEL, MD  
Aricat, NS

JAMES ROURKE, MD  
St. John's, Nfld.

CARL WHITESIDE, MD  
Vancouver, BC

Canadian Journal of Rural Medicine (CJRM) is owned by the Society of Rural Physicians of Canada (SRPC). It appears in Winter, Spring, Summer and Fall. It is printed by Dolco Printing, Ottawa.

Address all correspondence to: Editor, CJRM, Box 1086, Shawville QC J0X 2Y0; 819 647-2972, fax 819 647-9972, cjrm@lino.com

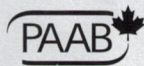
CJRM is indexed in *Index Medicus* and MEDLINE.

Publications Mail Agreement no. 41190522; Return undeliverable Canadian copies and address changes to: CMA Member Service Centre, CJRM, 1867 Alta Vista Dr., Ottawa ON K1G 3Y6; 888 855-2555, cmamsc@cma.ca. USPS #015-606. USPS periodical postage paid at Champlain, NY. Send US undeliverable copies to IMS of NY, 100 Walnut St., #1, Box 1518 Champlain NY 12919-1518.

ISSN 12037796

All prescription drug advertisements have been cleared by the Pharmaceutical Advertising Advisory Board.

Printed on acid-free paper from inception.



© 2006 Society of Rural Physicians of Canada

Canadian Journal

Journal canadien

of  
**Rural  
Medicine**

de la  
**médecine  
rurale**

**VOL. 11, No. 3, SUMMER / ÉTÉ 2006**

**EDITORIALS / ÉDITORIAUX**

177 Generalism and rural Canada — *Keith MacLellan, MD*

178 Le généralisme et le Canada rural — *Keith MacLellan, MD*

181 President's message. Growing like a weed  
— *Michael Jong, MD, MRCP(UK), CCFP, FCFP*

182 Message du président. Elle pousse comme mauvaise herbe  
— *Michael Jong, MD, MRCP(UK), CCFP, FCFP*

183 *The Canadian Journal of Non-Urban Medicine?*  
— *G. William N. Fitzgerald, MD, FRCSC*

185 For want of a scalpel — *Hugh Hindle, MB BS, CCFP, FCFP*

**ORIGINAL ARTICLES / ARTICLES ORIGINAUX**

187 Research methodology for the investigation of rural surgical services  
— *Erik Elleboj, PhD; Joshua Tepper, MD; Brendan Barrett, MB; Stuart Iglesias, MD*

195 Utilization rates for surgical procedures in rural and urban Canada  
— *Joshua Tepper, MD; William Pollett, MD; Yan Jin, MA; Erik Elleboj, PhD; Peter Hutten-Czapski, MD; Dan Schopflocher, PhD; Brendan Barrett, MB; Stuart Iglesias, MD*

207 Rural surgical services in two Canadian provinces  
— *Stuart Iglesias, MD; Joshua Tepper, MD; Erik Elleboj, PhD; Brendan Barrett, MB; Peter Hutten-Czapski, MD; Kir Luong, BSc; William Pollett, MD*

**PODIUM: DOCTORS SPEAK OUT  
LA PAROLE AUX MÉDECINS**

218 Is rural maternity care sustainable without general practitioner surgeons? — *Jude Kornelsen, PhD; Stefan Grzybowski, MD, MCISc, FCFP; Stuart Iglesias, MD*

**OFF CALL / DÉTENTE**

221 West Coast tale — *David Arnold, MD*



"REACH"

52" x 52" oil on canvas

Limited edition giclee reproductions available. Please see [www.beverleyrichardson.com](http://www.beverleyrichardson.com) for details. 2007 art calendar available now, in support of CARD (Community Association for Riding for the Disabled).

© 2005 Beverley Richardson



**PUBLISHER / ÉDITEUR**  
**CMA MEDIA INC. / AMC MÉDIA INC.**

CJRM is published for the SRPC by CMA Media Inc., 1867 Alta Vista Dr., Ottawa ON K1G 3Y6. The SRPC, the Canadian Medical Association (CMA) and CMA Media Inc. assume no responsibility or liability for damages arising from any error or omission, or from the use of any information or advice contained in the journal, including articles, editorials, case reports, reviews, book reviews, letters and advertisements. All editorial matter in CJRM represents the opinions of the authors and not necessarily those of the SRPC, the CMA or CMA Media Inc.

**PRESIDENT / PRÉSIDENT**  
GRAHAM MORRIS

**DIRECTOR / DIRECTRICE**  
GLENDA PROCTOR, MSc, ELs

**EDITOR / RÉDACTRICE**  
JENNIFER E. RAICHE  
800 663-7336 x2114  
[jennifer.raiche@cma.ca](mailto:jennifer.raiche@cma.ca)

**PRODUCTION**  
KATHRYN A. FREAMO  
NICOLE BARBEAU, CLARA WALKER

**ONLINE PUBLISHING**  
**PUBLICATION EN DIRECT**  
GARTH PYPER  
JEREMY SIMS, SHIRLEY WADDELL

**CLASSIFIED ADVERTISING**  
**ANNONCES CLASSÉES**  
BEVERLEY KIRKPATRICK  
DEBORAH RODD

**DISPLAY ADVERTISING**  
**ANNONCES PUBLICITAIRES**  
NANCY POPE

[advertising@cma.ca](mailto:advertising@cma.ca)

**MARKETING AND ADVERTISING SALES**  
**MARKETING ET PUBLICITÉ**  
KEITH COMMUNICATIONS INC.  
[info@keithhealthcare.com](mailto:info@keithhealthcare.com)  
Toronto: 905 278-6700; 800 661-5004  
fax 905 278-4850  
Montréal: 514 624-6979; 877 761-0447  
fax 514 624-6707

**INSTRUCTIONS FOR AUTHORS**

[See Spring 2006 issue or visit [www.srpc.ca](http://www.srpc.ca)]

**DIRECTIVES AUX AUTEURS**

[Voir le numéro d'été 2005 ou visitez [www.srpc.ca](http://www.srpc.ca)]

**SERVICE INFORMATION / RENSEIGNEMENTS GÉNÉRAUX**

[See Spring 2006 issue / Voir le numéro du printemps 2006, or/ou visit/visitez [www.srpc.ca](http://www.srpc.ca)]

*The progressive specialism that has characterized the practice of medicine over the last 100 years has occurred almost entirely in a scientific context. Societal needs and social changes have had little influence. As we near the end of the 20th century the benefits of scientific specialism are being questioned. New historical studies of specialism have shown that factors other than new knowledge are the driving force for the creation of some subspecialties. The process by which a new subspecialty is established requires both a national institute and a certification examination. Certification is intended to identify those with specific knowledge and skill by inclusion, but is being perceived increasingly as a process that works by exclusion. General surgery, one of the few "generalist" disciplines, finds itself at a crossroads. Further subspecialization with certification will fragment and destroy the discipline. There are cogent arguments, based on economics and care-delivery issues, to preserve general surgery. Making this choice will commit general surgeons to accept the concept of scientific generalism and to the development of the specialty of general surgery in a social context.*

— Introduction to the Canadian Association of General Surgeons Presidential Address, 1991, by John H. Duff. Specialism and generalism in the future of general surgery. *Can J Surg* 1992;35(2):131-5.

**ADVERTISERS' INDEX / INDEX DES ANNONCEURS**

**BAYER HEALTHCARE**

Adalat XL 204, 205

**BOEHRINGER INGELHEIM**

Spriiva 180

**CMA MEDIA INC.**

Inside Back Cover

**GLAXOSMITHKLINE**

Advair Inside Front Cover, 169

**MERCK FROSST CANADA LTD.**

172

**PFIZER CANADA INC.**

Arthrotec 206

Caduet Outside Back cover

Lipitor 174, 175

**SANOFI AVENTIS**

Altace 170

**SANOFI AVENTIS/BRISTOL-MYERS**

**SQUIBB**

Plavix 179

**SOLVAY PHARMA**

Pantoloc 176

**PRESCRIBING INFORMATION**

Adalat XL 224

Advair 228, 229, 230

Altace 240

Arthrotec 234, 235

Caduet 231, 232, 233

Lipitor 236, 237

Pantoloc 241

Plavix 238, 239

Spiriva 225, 226, 227



# Generalism and rural Canada

Keith MacLellan, MD  
Shawville, Que.

Correspondence to: Dr. Keith  
MacLellan, PO Box 609,  
Shawville QC J0X 2Y0

By all means, if possible, let [the young physician] be a pluralist, and — as he values his future life — let him not get early entangled in the meshes of specialism.<sup>1</sup>

**W**e salute those dedicated practitioners providing surgical services to Canadian rural populations. They are truly the heart of all rural health care, and this issue of the *CJRM* is for them.

Without an operating room (OR) most rural hospitals can offer primary care, basic hospitalizations and triage — important, but inadequate, as laboratory resources crumble, precluding any kind of secondary care. Given Canada's geography, how far then must rural patients travel to get even the most basic of secondary care?

The problem with Canadian rural health care is that our medical system is squeezing out the generalist — both in family medicine and surgery.

Two characteristics define the rural workforce: 1) community importance in determining needs, and 2) the work of jack-of-all-trades or generalists. This holds true for most of the rural workforce but is quite evident in health care. We see these 2 characteristics in any rural OR — in the broadly trained nurses, the GP-anesthesiologist, the GP-surgeon or the fellowship surgeon with skills in many disciplines.

And what is a generalist? The intellect naturally specializes and, by contrast, the artist within, integrates. The generalist is found somewhere on the spectrum between these 2 poles, the location continually varying. The generalist is best suited to deal with sick humanity while, at the 2 poles, the specialist and the artist serve the medical

generalist. This argument is found in reading Osler, who might agree that the hallmark of generalism is one or several “defined competencies.” A defined competency is the partial practice of a discipline — “defined” in the sense of being circumscribed but also in the sense of matching a social need; “competency” in the sense of a capable skill set. A defined competency implies the best of what physicians have always done — devoting themselves to healing, responding to social needs, research, teaching, understanding limits and lifelong learning.

Defined competencies link, for example, the fellowship general surgeon pinning hips with a family doctor performing cesarean sections. Ideally, the competency is defined by the needs of the community and supported by the entire medical system. The needs of rural communities are unavoidable. Unfortunately, system support vanishes as differentiation of our medical workforce accelerates. Without validation of defined competencies at all levels of the medical system, especially nationally, the generalist's lot is doomed. Inevitably, rural surgeons are among the most vulnerable.

Rural Canada needs the generalist with defined competencies, constantly fluctuating between the primary, secondary and tertiary levels of care. Those who advocate for tightly compartmentalized levels of secondary care or those who want family medicine to be a primary care specialty are not just denying centuries of careful generalist medical practice, they are abandoning a large part of what defines Canada.

### REFERENCE

1. Osler W. Internal medicine as a vocation. *Med News* 1897;71:660.



# Le généralisme et le Canada rural

Keith MacLellan, MD  
Shawville (Que.)

Correspondance : Dr Keith  
MacLellan, CP 609,  
Shawville QC J0X 2Y0

Laissons si possible, par tous les moyens, [le jeune médecin] être pluraliste et — comme il attache de la valeur à sa vie future — évitons-lui de se laisser prendre tôt dans les filets de la spécialisation.<sup>1</sup> [Traduction]

**N**ous saluons les praticiens dévoués qui fournissent des services chirurgicaux aux populations rurales du Canada. Ils sont véritablement le cœur des soins de santé en milieu rural, et ce numéro du *JCMR* leur est dédié.

Sans salle d'opération, la plupart des hôpitaux ruraux peuvent offrir des soins primaires, des services d'hospitalisation et de triage de base — importants, mais inadéquats à mesure que les ressources de laboratoire s'effritent, ce qui empêche d'offrir tout type de soins secondaires. Compte tenu de la géographie du Canada, quelle distance doivent alors parcourir les patients ruraux pour obtenir même les soins secondaires les plus élémentaires?

Le problème des soins de santé en milieu rural au Canada, c'est que notre système médical exclut graduellement le généraliste — tant en médecine familiale qu'en chirurgie.

Deux caractéristiques définissent les effectifs ruraux : 1) l'importance de la communauté dans la détermination des besoins et 2) le travail des polyvalents ou généralistes. Ces caractéristiques s'appliquent à la plupart des travailleurs ruraux, mais elles sont particulièrement évidentes dans le secteur des soins de santé. Nous constatons ces deux caractéristiques dans toute salle d'opération rurale — chez l'infirmière qui a suivi une formation générale, l'omnipraticien anesthésiste, l'omnipraticien chirurgical ou le fellow chirurgical possédant des compétences dans de nombreuses disciplines.

Et qu'est-ce qu'un généraliste? L'intellect tend naturellement à se spécialiser, tandis que notre artiste intérieur, lui, intègre. Le généraliste se trouve quelque part entre ces deux pôles, à un endroit qui change constamment. Le généraliste convient le mieux pour traiter l'humain malade, tandis qu'aux deux pôles, le spé-

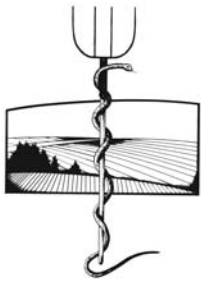
cialiste et l'artiste sont au service du généraliste médical. On retrouve cet argument en lisant Osler, qui pourrait reconnaître qu'une ou plusieurs «compétences définies» constituent la marque du généralisme. On entend par compétence définie la pratique partielle d'une discipline — qui est «définie» au sens d'être délimitée mais aussi de son jumelage à un besoin social; «compétence» s'entend d'un ensemble de connaissances spécialisées. Une compétence définie sous-entend le meilleur de ce que les médecins ont toujours fait — se consacrer à leur travail de guérisseur, répondre aux besoins de la société, effectuer de la recherche, enseigner, comprendre des limites et apprendre leur vie durant.

Les compétences définies relient, par exemple, le chirurgien général boursier en recherche qui pratique des arthroplasties de la hanche et le médecin de famille qui effectue des césariennes. Idéalement, la compétence est définie par les besoins de la communauté et appuyée par le système médical dans son ensemble. Les besoins des communautés rurales sont incontournables. L'appui du système disparaît malheureusement à mesure que la différenciation de nos effectifs médicaux s'accélère. Sans validation des compétences définies à tous les paliers du système médical, et en particulier à l'échelle nationale, le généraliste est condamné, et les chirurgiens ruraux sont inévitablement parmi les plus vulnérables.

Le Canada rural a besoin du généraliste qui possède des compétences définies, fluctuant constamment entre les soins primaires, secondaires et tertiaires. Ceux qui préconisent des niveaux de soins secondaires rigoureusement compartimentés ou qui souhaitent que la médecine familiale soit une spécialité des soins primaires ne font pas que nier des siècles de pratique généraliste prudente de la médecine : ils laissent aussi tomber une grande partie de ce qui définit le Canada.

### RÉFÉRENCE

1. Osler W. Internal medicine as a vocation. *Med News* 1897;71:660.



### President's message. Growing like a weed

*Michael Jong, MD,  
MRCP(UK), CCFP,  
FCFP*

*Happy Valley–Goose Bay,  
Newfoundland and Labrador*

*Correspondence to:  
Dr. Michael Jong,  
Box 205, Station B,  
Happy Valley–Goose Bay  
NL A0P 1E0*

**Society of Rural  
Physicians of Canada**

**Société de la médecine  
rurale du Canada**

**PRESIDENT / PRÉSIDENT**

MICHAEL JONG, MD, MRCP(UK), CCFP,  
FCFP

*Happy Valley–Goose Bay,  
Newfoundland and Labrador*

**PAST-PRESIDENT**

**PRÉSIDENTE SORTANTE**

TRINA M. LARSEN SOLES, MD  
Golden, BC

**SECRETARY / SECRÉTAIRE**

HUGH HINDLE, MB BS, CCFP  
Hinton, Alta.

**TREASURER / TRÉSORIÈRE**

BRAAM DE KLERK, MB ChB, DCH,  
DIP OBST  
Inuvik, NT

**MEMBERS-AT-LARGE**

**MEMBRES EXTRAORDINAIRES**

SANDY MACDONALD, MD, CCFP  
Iqaluit, Nunavut

KARL STOBBE, MD, CCFP(EM), FCFP  
Beamsville, Ont.

BEV KARRAS, MD  
Nipawin, Sask.

**ADMINISTRATIVE OFFICER**

**RESPONSABLE ADMINISTRATIF**

LEE TEPERMAN  
SRPC Office, Shawville, Que.

**SRPC / SMRC**

Box 893  
Shawville QC J0X 2Y0  
819 647-7054, 877 276-1949  
fax 819 647-2485  
admin@srpc.ca  
www.srpc.ca

Our Society of Rural Physicians of Canada is only 14 years old. Realistically speaking, it is just reaching puberty — the age of my teenage son, Robert. Like Robert, we are growing like a weed, with the youth of our organization providing us with a sense of adventure, vibrancy and resiliency. Our membership has increased fifty-fold, from 40 to over 2000, and it continues to grow stronger every day. We are looking forward to a great future.

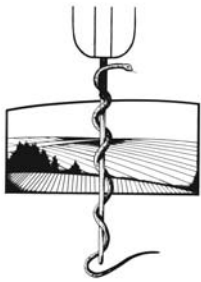
The strength of the SRPC lies in its members, down-to-earth rural docs, keen residents and enthusiastic medical students. Many have been great champions and ambassadors for enhancing rural health. Our voice for better health care for our rural communities is getting greater attention. We have increasing linkages with other national organizations that have collaborated with our society to improve our ability to look after the health of rural Canadians.

We have more residents than ever choosing family residency programs with rural content. An increasing number of medical students are looking at rural practice as a career choice. We have active resident and medical student committees within the SRPC who are showing great passion for rural medicine. Currently, our focus is on family medicine career paths as a route to rural practice. Hopefully we will instill the desire of other primary specialties such as general surgery, obstetrics and gynecology, internal medicine, anesthesia and psychiatry to “go rural.”

This can only occur with affirmative action for admission of students with rural backgrounds to medical schools, and rural placements during training both at the undergraduate and postgraduate level. We have a number of non-family medicine specialists who are members of our Society and who require the SRPC's support in advancing their struggle to enhance rural practice.

This year the SRPC had the privilege to honour Dr. Carl Whiteside with the Rural Leadership Award. Carl has been a key player in making the rural family medicine stream a big component of the training program at the University of British Columbia. He has promoted our Rural and Remote Medicine Conference to his residents and students and has encouraged them, in more ways than one, to attend our annual conference. He has made rural practice a desirable career choice for many of his students and residents.

The SRPC's approach to professional development is one that many rural physicians, residents and students can identify with as being more in line with what they need to know in rural practice. Our Rural and Remote Medicine Conferences draw progressively more registrants. In Winnipeg this April we had almost 400 participants, a far cry from the 40 who met in a downtown Montréal hotel 14 years ago. We will continue to enhance the content of our Rural and Remote Medicine Conference and work to develop our rural critical care modules into a complete package.



# Message du président. Elle pousse comme mauvaise herbe

*Michael Jong, MD,  
MRCP(UK), CCFP,  
FCFP*

*Happy Valley-Goose Bay,  
Newfoundland and Labrador*

*Correspondance :  
Dr Michael Jong, CP 205,  
Station B, Happy  
Valley-Goose Bay NL  
A0P 1E0*

**N**otre Société de la médecine rurale du Canada a 14 ans à peine. Soyons réalistes : elle arrive tout juste à la puberté — l'âge de mon fils adolescent, Robert. Comme Robert, nous poussons comme mauvaise herbe, la jeunesse de notre organisation nous donnant un sentiment d'aventure, de dynamisme et de résilience. Le nombre de nos membres s'est multiplié par cinquante pour passer de 40 à plus de 2000 et il continue d'augmenter tous les jours. Un bel avenir nous attend.

La force de la SMRC réside dans ses membres, médecins ruraux ayant les deux pieds sur terre, résidents éveillés et étudiants en médecine enthousiastes. Ils et elles sont nombreux à avoir été de grands défenseurs et ambassadeurs d'une amélioration de la santé rurale. De plus en plus, nous attirons l'attention lorsque nous militons en faveur de meilleurs soins de santé pour nos communautés rurales. Nous avons de plus en plus de liens avec d'autres organisations nationales qui ont collaboré avec notre société pour améliorer notre capacité de nous occuper de la santé des populations rurales du Canada.

Plus de résidents que jamais choisissent des programmes de résidence en médecine familiale en contexte rural. De plus en plus d'étudiants en médecine considèrent la pratique en milieu rural comme un choix de carrière. Nous avons à la SMRC des comités actifs de résidents et d'étudiants en médecine qui montrent une grande passion pour la médecine rurale. Nous concentrons actuellement notre attention sur les cheminements de carrière en médecine familiale comme accès à la pratique en milieu rural. Nous espérons instiller à d'autres spécialités primaires comme la chirurgie générale, l'obstétrique et la gynécologie, la médecine interne, l'anesthésie et la psychiatrie un intérêt pour la pratique en milieu rural. Il faut

à cette fin mettre en place des programmes d'action positive pour admettre dans les facultés de médecine des étudiants qui ont des antécédents ruraux, et offrir des stages en milieu rural pendant la formation au niveau tant prédoctoral que postdoctoral. Nous comptons un certain nombre de spécialistes de la médecine non familiale qui sont membres de la Société et qui ont besoin de l'appui de la SMRC pour faire progresser leur lutte visant à améliorer la pratique en milieu rural.

Cette année, la SMRC a eu le privilège de rendre hommage au Dr Carl Whiteside en lui décernant son Prix de leadership en médecine rurale. Carl a joué un rôle clé pour faire du volet de médecine familiale en milieu rural un élément important du programme de formation à l'Université de la Colombie-Britannique. Il a fait la promotion de notre Conférence sur la médecine en milieu rural et éloigné auprès de ses résidents et étudiants, qu'il a encouragés de multiples façons à assister à notre conférence annuelle. Il a aussi fait de la pratique en milieu rural un choix de carrière désirable pour beaucoup de ses étudiants et résidents.

Beaucoup de médecins ruraux, de résidents et d'étudiants peuvent s'identifier à la stratégie de perfectionnement professionnel de la SMRC, car elle correspond davantage à ce qu'ils doivent connaître en médecine rurale. La Conférence sur la médecine en milieu rural et éloigné attire de plus en plus de participants. À Winnipeg, en avril, nous en avons accueilli près de 400, ce qui est loin des 40 qui se sont rencontrés dans un hôtel du centre-ville de Montréal voilà 14 ans. Nous continuerons d'améliorer le contenu de notre Conférence sur la médecine en milieu rural et éloigné et nous poursuivons nos efforts pour faire de nos modules sur les soins intensifs en milieu rural un programme complet.



# The Canadian Journal of Non-Urban Medicine?

G.W. N. Fitzgerald,  
MD, FRCSC

Charles S. Curtis Memorial  
Hospital, St. Anthony,  
Newfoundland and Labrador

Correspondence to: Dr. G.  
William N. Fitzgerald,  
Charles S. Curtis Memorial  
Hospital, St. Anthony NL  
A0K 4S0

See articles on pages 187,  
195 and 207.

**T**his edition of the Journal contains 3 related articles pertaining to the conduct of surgery in rural Canada.<sup>1-3</sup>

The first article tackles the controversial issue of defining “rural” and by default adopts everything *non-urban*.<sup>1</sup>

The *Concise Oxford Dictionary* defines “default” as *a pre-selected option when no alternative is specified*.<sup>4</sup> This meaning is familiar to any modern computer user. “Default,” however, is also defined as *a failure to fulfill an obligation*. The word comes from Old French *default*, from *defaillir* meaning *to fail* — itself based on the Latin *fallere*, *to disappoint or to deceive*.

Considering surgical services rural Canadians have every right to be disappointed, for the system *has* failed them. They have been deceived when it comes to the promise of universal, accessible, comprehensive health care — 3 of the 5 pillars of medicare.

Residents in training have little exposure to rural/community surgery role models and, having trained largely in a tertiary care setting, are poorly suited to confront the eclectic challenges of rural practice.

The authors<sup>1</sup> go on to describe a system whereby catchment areas and populations may be defined for any given surgical service as determined by travel times and incorporating referral data, postal codes and census information.

The second article applies the methodology of the first in a comparison of the non-urban surgical services in Alberta and Northern Ontario.<sup>2</sup> The study focuses on 4 procedures — carpal tunnel decompression, inguinal hernia repair, appendectomy and cholecystectomy. Because of differences in geography and hence road structure,

lifestyle, resource base, regulatory provisions and workforce, this is very much a comparison of apples with oranges. It does, however reflect the Canadian reality. Services are centralized in Northern Ontario and significantly decentralized in Alberta, where a larger number of international medical graduates (IMGs) and some FP-surgeons are employed. Notwithstanding, 70%–90% of the index procedures performed on non-urban residents of Alberta were performed by Canadian-certified general surgeons working in urban centres. In rural Northern Ontario, regional centres staffed mainly by Canadian-certified general surgeons tend to retain most of their cases. In Alberta, IMG general surgeons and FP-surgeons play a larger role in complementing Canadian-trained general surgeons in the more sophisticated non-urban sites.

The third article in this series compares utilization rates for 8 surgical procedures between urban and non-urban residents living in Alberta and Northern Ontario.<sup>3</sup> The procedures considered include appendectomy, carpal tunnel decompression, hip fracture repair, surgery for cancer of the rectum, joint replacement, thyroid surgery, inguinal hernia repair and cholecystectomy. The authors found higher utilization rates among rural residents in both Alberta and Northern Ontario for cholecystectomy, carpal tunnel decompression and appendectomy. Furthermore, this rate was independent of the sophistication of local surgical services. For the other procedures the utilization rates between rural and urban dwellers were similar. Only the rate of carpal tunnel decompression, a highly discretionary procedure, was found to be negatively influ-



enced by a travel time requirement of greater than one hour. Such data may have relevance to the planning of surgical services into the future. It is intriguing to speculate that the demand for more physical activity among rural Albertans lead to the greater requirement for joint replacement in that province. However, this finding may reflect sampling artifact over a relatively short study period or simply a *well-oiled* referral pattern!

I commend the authors in their attempts to bring science to bear on rural surgical practice in Canada, a country rife with regional diversity. I commend as well the collaborative nature of this research. Certainly more such collaboration among *family physicians and other specialists*, other health care professionals, governments, regulatory bodies, medical schools and the rural public — to name a few — is essential if the legitimate demands of our rural populations are to be addressed. In such collaboration the emphasis should be on maximizing ability and competence and, given the circumstances, on how we can best support one another to the ultimate benefit of the public we serve. The importance of surgical expertise in the support of other services such as obstetrics and family practice is acknowledged. The aging of rural general surgeons, who are killing themselves with overwork, the feminization of the profession and the rightful insistence of the upcoming generation of doctors on a balanced lifestyle are only some of the many factors that will have to be taken into account.

Unlike others, I do not believe the *rural problem* is simply going to go away as populations drift toward the cities. Rural Canada supplies many of the resources that are the wealth of this country which, along with our long-neglected farms and fisheries, hold the key to our self-sufficiency. Given current geopolitical realities, rising oil prices, a looming pandemic and global warming, self-sufficiency should be forefront in the mind of every Canadian. Enlightened self-interest too means producing enough health care professionals that we stop poaching the best and brightest from other, often less fortunate, nations and extend the helping hand of friendship in a troubled, interdependent world.

For me the definition of rural Canada has no negative connotation. I did not end up here by default. Rural Canada is simply and positively the place I choose to live!

#### REFERENCES

1. Ellehoj E, Tepper J, Barrett B, et al. Research methodology for the investigation of rural surgical services. *Can J Rural Med* 2006;11(3):187-94.
2. Iglesias S, Tepper J, Ellehoj E, et al. Rural surgical services in two Canadian provinces. *Can J Rural Med* 2006;11(3):207-17.
3. Tepper J, Pollett W, Jin Y, et al. Utilization rates for surgical procedures in rural and urban Canada. *Can J Rural Med* 2006;11(3):195-203.
4. *The Concise Oxford Dictionary*. 10th ed. Oxford: Oxford University Press; 1999.

### La médecine d'urgence en région : La nouvelle séduction Congrès médicale (2<sup>e</sup> édition)

Les Escoumins récidive les 14, 15 & 16 septembre 2006  
Réservez ces dates à votre agenda!!! Places limitées

Pour inscription ou information : Marjolaine Tremblay, coordonnatrice  
marjolainetremblay@hotmail.com, 418 233-2155, 418 233-2931

Le comité scientifique : Janie Giard, md, présidente, Rémi Mercier, md  
C.S.S.S. de la Haute-Côte-Nord, 4, rue de l'Hôpital, Les Escoumins QC G0T 1K0



### For want of a scalpel

*Hugh Hindle, MB BS,  
CCFP, FCFP*

*Rural Physician,  
Sylvan Lake, Alta.;  
Rural Academic Development  
Coordinator, Alberta Rural  
Physician Action Plan*

*Correspondence to:  
Dr. Hugh Hindle, Sylvan  
Family Health Centre,  
4956 50th Ave.,  
Sylvan Lake AB T4S 1C0;  
hugh.hindle@arfmn.ab.ca*

**Disclaimer:** *The opinions  
expressed in this article are  
personal and do not represent  
the views of the Alberta Rural  
Physician Action Plan.*

*See accompanying articles,  
pages 187, 195 and 207.*

For want of a nail the shoe was lost.  
For want of a shoe the horse was lost.  
For want of a horse the rider was lost.  
For want of a rider the battle was lost.  
For want of a battle the kingdom was lost.  
And all for the want of a horseshoe nail.

[Traditional rhyme]

One of the fascinations of examining rural practice is discovering the variety of ways in which the same medical needs are met in different communities. The evolution of service provision seems to depend on numerous factors, including local geography and demographics, training or mentoring opportunities, licensing policies and even immigration regulations, as Iglesias and colleagues suggest (see page 207).<sup>1</sup> This mix of general practitioners (GPs), GPs with special skills in surgery, anesthesia or obstetrics, and specialists has provided local care with no evidence that outcomes for routine procedures such as appendectomy would be improved by transfer to larger, higher volume centres.<sup>2</sup> Indeed, some studies suggest worse outcomes for obstetrical patients in “outflow” communities where women need to travel for delivery.<sup>3,4</sup>

The pipeline that has produced such capable physicians is now under threat as the current surgical cohort approach retirement. Where will our next generation of rural surgeons come from? Recruitment of general surgeons throughout the country will be challenging, with estimates of a shortfall of 185 general surgeons within Ontario by 2010.<sup>5</sup> In rural Canada the situation is likely to be worse: by 2002, 40% of rural general surgeons were over the age of 65.<sup>6</sup> Newly trained general surgeons

are likely to have a narrower scope of practice compared with the “tonsil to toenail” generalists currently in place. Although we can hope that the post-graduate surgical programs of the new rural medical schools will work to address these issues, a rural shortfall seems certain. For communities near to specialist centres there may be some opportunity to expand itinerant surgery programs, but these will not meet the needs of more distant areas.

An obvious solution is to develop the pool of GP surgeons. This pool historically has been filled in different ways: by third-year family medicine residencies or re-entry training programs run by universities, and by the assessment and credentialling of appropriately trained international medical graduates (IMGs). There have been great successes with this approach in anesthesia and obstetrics. However, in surgery, the story is different. The most successful program for training GP surgeons has been at the University of Alberta. Over a 12-year period, 16 physicians have completed a 6-month program, usually combined with 6 months of obstetrics, thus taking invaluable skills back to their communities. Although the university remains supportive, the program can no longer find preceptors willing to provide meaningful training. In a parallel process, access to competency assessment before credentialling has become a formidable stumbling block for IMGs.

At a time when competency-based evaluation has become widely advocated, it is ironic that such seemingly insurmountable barriers to training and assessment have become commonplace, so that it is difficult for GPs to access training not only in surgery but

also in other extended skills such as endoscopy, ultrasonography or colposcopy. A number of possibilities may explain the reluctance on the part of the relevant specialist groups to facilitate training. Foremost are concerns about quality of care, but such issues do not appear to be evidence-based for the type of procedures performed in rural Canada. A subsidiary problem may be that of possible legal liability arising out of training or assessment. Potential legal problems include being held responsible for the future performance of a trainee or the difficulties arising from a refusal to credential the inadequate trainee. Unfortunately, there is a tendency for discussions about training or credentialing GPs with extended procedural skills to become derailed by diverging opinions about the theoretical appropriateness of non-specialists performing appendectomies.

**WHERE WILL OUR NEXT GENERATION  
OF RURAL SURGEONS COME FROM? ...  
[THERE ARE] ESTIMATES OF A  
SHORTFALL OF 185 GENERAL  
SURGEONS WITHIN ONTARIO  
BY 2010.**

We need to reframe the debate and focus instead upon the health needs of rural communities, just as we managed to do with our anesthesia and obstetric specialty colleagues. The importance of surgical practice within a community is about much more than whether patients can have appendectomies locally. It is also about maintaining the expertise of operating room staff and providing sufficient volume to ensure the competence of GP anesthetists, so that the emergency cesarean can be performed, the patient with a severe head injury intubated or a surgical airway accessed in an emergency situation. The provision of all these skills is interdependent and of great value to the health of our communities. Just as the lack of a nail led to the loss of the kingdom, the absence of a surgeon all too often leads to the loss of obstetric services and even the loss of physicians in our rural areas.

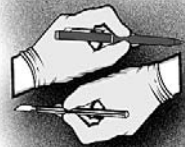
The faculties of medicine in Canada now accept that they have a social accountability mandate to

ensure they provide appropriate medical training for the population that they serve. Facilitating the training and assessment of physicians with appropriate extended procedural skills clearly fits within this mandate. The make-up of these skills will vary from community to community depending on local resources and geography. Doctors entering training programs will need to develop a list of objectives derived from a review of local needs and supported by hospital boards or regional health authorities. These objectives will likely transcend individual disciplines and might include cesarean section, tubal ligation, vasectomy, appendectomy, endoscopy, carpal tunnel release, extensor tendon repair, drainage of abscesses, needle biopsy and minor plastic procedures, with the exact mix customized to fit the requirements of the local community and the skills of the trainee. Training should be brokered with the assistance of a faculty of medicine, but could take place in tertiary care centres, community or regional hospitals, and preferably in the facility that the trainee will later use as a referral centre. This will foster the development of an ongoing mentoring relationship, perhaps supported by telehealth. Universities must assist preceptors by developing appropriate assessment tools to determine competence and by indemnification against potential legal issues.

Unless we move rapidly to implement such training and assessment programs, traditional rural medicine is at risk of withering away, with ever greater burdens falling to our urban facilities and a further decline in rural health indicators.

#### REFERENCES

1. Iglesias S, Tepper J, Ellehoj E, et al. Rural surgical services in two Canadian provinces. *Can J Rural Med* 2006;11(3):207-17.
2. Iglesias S, Saunders LD, Tracy S, et al. Appendectomies in rural hospitals: safe whether performed by specialist or GP surgeons. *Can Fam Physician* 2003;59:328-33.
3. Larimore WL, Davis A. Relationship of infant mortality to availability of care in rural Florida. *J Am Board Fam Pract* 1995;8:392-9.
4. Nesbitt TS, Connell FA, Hart LG, et al. Access to obstetric care in rural areas: effect on birth outcomes. *Am J Public Health* 1990;80:814-8.
5. Ros K, Drzymala L. Planning physician services. Is there a method to the madness? *Univ Toronto Med J* 2002;79:257-62.
6. Pollett WG, Harris KA; for the Canadian Association of Surgical Chairs. The future of rural surgical care in Canada: a time for action. *Can J Surg* 2002;45:88-90.



## ORIGINAL ARTICLE ARTICLE ORIGINAL

# Research methodology for the investigation of rural surgical services

*Erik Elleboj, PhD*

*Research and Evidence  
Branch, Alberta Health  
and Wellness*

*Joshua Tepper, MD*

*Institute for Clinical  
Evaluative Sciences,  
Toronto, Ont.*

*Brendan Barrett, MB*

*Professor of Medicine,  
Memorial University of  
Newfoundland, St. John's,  
Nfld.*

*Stuart Iglesias, MD*

*Rural Family Physician,  
Gibsons, BC*

*Correspondence to:*

*Dr. Erik Elleboj,  
11456 45 Ave.,  
Edmonton AB T6J 0Y4*

*See also Editorial on page  
185, and accompanying arti-  
cles, pages 195 and 207.*

This paper describes a functional approach to the definition of rural populations for purposes of rural health care research. Rather than define “rural” directly, we created a definition of urban populations and our research target became the non-urban component. Using Geographic Information Systems technology, isochrones (drivetime zones) were created that attached suburban populations to urban centres and mapped non-urban populations into rural hospital catchment areas.

For population-based analyses, we have proposed a methodology for constructing catchment areas attached to Rural, Regional and Metropolitan services. We have developed a model for calculation of travel time for patients required to travel for care. We successfully applied these methodologies to the disparate regions of rural Alberta and Northern Ontario in 2 papers that investigated the delivery of rural surgical services.

This methodology represents a durable and portable designation of “rural” with potential for research applications in other areas of health research. By defining “urban” rather than “rural,” we avoided many of the methodological conundrums in this research field.

Cet article décrit une approche fonctionnelle de la définition des populations rurales aux fins de la recherche sur les soins de santé en milieu rural. Au lieu de définir directement le mot «rural», nous avons créé une définition des populations urbaines et la composante non urbaine est devenue la cible de notre recherche. Nous avons créé, au moyen de la technologie des systèmes d'information géographique, des isochrones (zones de durée des déplacements) qui ont jumelé des populations suburbaines à des agglomérations urbaines et cartographié des populations non urbaines en bassins hospitaliers ruraux.

Pour les analyses démographiques, nous avons proposé une méthodologie de construction de bassins rattachés à des services ruraux, régionaux et métropolitains. Nous avons mis au point un modèle de calcul de la durée des déplacements pour les patients qui doivent se déplacer pour obtenir des soins. Nous avons appliqué avec succès ces méthodologies aux régions disparates des milieux ruraux de l'Alberta et du Nord de l'Ontario dans deux communications où nous avons étudié la prestation des services de chirurgie en milieu rural.

Cette méthodologie propose une désignation durable et transférable du mot «rural» qu'il pourrait être possible d'appliquer dans d'autres domaines de la recherche sur la santé. En définissant le mot «urbain» plutôt que le mot «rural», nous avons évité un grand nombre d'énigmes méthodologiques dans ce domaine de recherche.

## INTRODUCTION

Canada's expansive geography is a defining feature of the country and an important consideration in the delivery of health services. A number of important health care decisions are related to geography and distance. Geographic areas can be defined for regional distribution of resources. Distances are used

to help determine the accessibility of services to the population. Geographic patterns of health utilization can identify overlapping service provision and opportunities for rationalization of services. Distances are also used in determining funding models as well as defining recruitment and retention initiatives for health care providers.

With funding from Health Canada,

the Society of Rural Physicians of Canada and the Canadian Association of General Surgeons invited interested parties to collaborate on research that would examine (i) whether utilization and outcomes of surgical services were the same for rural and urban Canadians, and (ii) whether the presence of local rural surgical programs or the distance to travel for surgical care has an impact on utilization and outcomes.<sup>1,2</sup> To conduct this research we had to address 3 methodological issues, which are the focus of this paper. Our overall research targeted surgical services in Alberta and Northern Ontario, with a special emphasis on rural populations. Our research questions centred around the issues of access to surgical services by these rural populations and the health human resource profiles of surgical care in communities outside urban Canada.

Alberta and Northern Ontario were chosen, in part because of their contrast in geography, population distribution and rural surgical delivery systems. There is little agricultural land in Northern Ontario, due to the Canadian Shield. The non-urban population is clustered in small resource-based communities, with populations of usually less than 5000, with little or no population in the surrounding hinterland. Rural Alberta has an agriculturally based population. The non-urban communities are larger, with substantial catchment from the surrounding farms and ranches.

### THREE METHODOLOGICAL ISSUES

This paper explains the 3 methodologies used to i) define "rural," ii) define "catchment areas" (CAs), and iii) measure distances travelled by patients for health care.

- i) First, we required a definition of "rural." There are many such definitions.<sup>3</sup> Ultimately, the most appropriate definition is usually chosen with regard to the available data and the context of the research questions.
- ii) If access to surgical services locally is to be tested as an independent variable for utilization and outcome results, then geographic CAs must be created that attach populations to local hospitals. The challenges associated with identifying unique "markets" for individual hospitals are outlined by Thall and colleagues.<sup>4</sup>
- iii) These projects required a methodology to measure distance. This measure had 2 specific applications in our research. First, we considered distance from an urban centre to be relevant to our designation of non-urban populations. Sec-

ond, we required a measure of distance when we tested whether the obligation to travel for testing, consultation or surgery might influence utilization or outcome.

### *Defining "rural" by defining "urban"*

Our methodology is based on a definition of "urban." The remainder of the population (non-urban) in both provinces became, by design, our rural population. Why non-urban Canada? In the evolution of the popular and prevalent primary/secondary/tertiary care paradigm, developed by/for urban Canada, training and privileges in procedural care is restricted to hospital-based specialist providers. However, rural Canada has few specialists. Our inquiries about access to and utilization of surgical services in communities with few or no specialists and our interest in generalists working outside the primary/secondary/tertiary care model required us to look outside of urban Canada. This huge (largely heterogeneous in most other dimensions), non-urban population collectively shared the characteristic of having to access procedural care without a significant local specialist presence. The definition avoided the problems usually associated with "rural" and provided remarkable consistency within and between provinces. Acknowledging the heterogeneity of this default population, we built into our modelling exercise other independent descriptive variables, such as travel time to definitive surgical care and the size and scope of local surgical services.

We included in the urban population all of the Census Metropolitan Areas and a subset of the Census Agglomeration Areas (Table 1). We needed a decision rule to identify which of the Census Agglomeration Areas would be considered urban. In previous studies<sup>5,6</sup> of rural surgical services the authors have specified that health care programs are rural if they are provided exclusively, or almost exclusively, by family physicians with no, or few, local specialists. We adopted this decision rule and restricted our inclusion of Census Agglomeration Areas in our urban population only if they had a significant (>2) specialist presence (outside of general surgery) on the local medical staff. Ultimately, this cut-off was a population of 35 000 for a Census Agglomeration Area to be "urban."

Once the urban centres were identified, it was necessary to remove the surrounding population served by the facilities from the equation. We had, for other purposes, established a difference between Metropolitan centres (that included a medical

school) and Regional centres (>35 000 with a significant specialist presence other than general surgery). In Alberta, the Metropolitan centres were Edmonton and Calgary. There are no Metropolitan centres in Northern Ontario that meet this definition. Instead, the city of London in Southwestern Ontario was selected.

We chose a 60-minute drivetime around the Metropolitan centres and a 30-min drivetime around the Regional centres to capture the urban population (60:30 rule). Our rationale for a longer drivetime for the Metropolitan centres was their significant size (>400 000) and services. These were expected to have a greater gravitational pull than the Regional centres. The choices of 60 and 30 minutes were arbitrary. The drivetime zones were validated by comparison with the 5 rural categories assigned\* by Statistics Canada to the Enumeration Areas (EAs). The non-rural EAs occupied zones similar in size to the drivetime zones. EAs were used instead of Dissemination Areas because EAs were used for postal code assignment by Alberta Health and Wellness until late 2005. The use of a consistent set of boundaries was considered more important than the availability of more current boundaries, especially when these were amalgamated into groups.

The use of Statistics Canada's urban-rural categories was carefully explored, but they were unsuited to our purposes because of their inconsistent size.

\*Statistics Canada defines urban to rural areas in 5 categories: urban core, secondary urban core, urban fringe, rural fringe, and rural. Available: [www.statcan.ca/english/census20001/dict/geo050.htm](http://www.statcan.ca/english/census20001/dict/geo050.htm)

The 5 urban-rural categories were derived from workplace and residence location as indicated in the census. Some cities have large commuting areas, and others do not; the goal of this analysis was to investigate access to services that is based on travel time.

The isochrones for the urban population were created using the road networks surrounding each urban Census Agglomeration Area and Census Metropolitan Area, along with appropriate speed limits. Delays were added at intersections according to posted right-of-way rules. The hospital facility was chosen as the starting point for the drivetime calculations.

In summary, the urban population was defined as those people with postal codes within a 1-hour drivetime of a Metropolitan centre (medical school) and/or within a 30-min drive to the remaining Census Metropolitan Areas and urban Census Agglomeration Areas (pop. >35 000). This definition takes into consideration appropriate speed limits and delays at intersections. Our rural population is the non-urban population.

### *Hospital catchment areas*

Studies of health service delivery are typically designed to look at boundaries that reflect the "market" for each hospital. Hospital CAs ensure that there is only one facility within each reporting boundary. Hospital CAs allow the data to be analyzed in the context of the facility providing the service. Any changes that may be contemplated must be examined in the context of the data for the facility and for other relevant facilities. Any analysis of service disparity,<sup>7</sup> service access<sup>8-10</sup> or facility market

Designation	Alberta		Northern Ontario	
	City / town	Population	City / town	Population
CMA	Calgary	951 395	Sudbury	155 601
	Edmonton	937 845	Thunder Bay	121 986
CAA / Urban	Red Deer	67 707	North Bay	63 861
	Lethbridge	67 374	Sault Ste. Marie	78 908
	Medicine Hat	61 735	Timmins	43 680
	Fort McMurray	42 602		
	Grande Prairie	36 983		
CAA / Non-urban	Brooks	11 604	Elliot Lake	11 956
	Camrose	14 854	Haileybury– New Liskerd	12 867
	Cold Lake	27 935	Kenora	15 838
	Wetaskiwan	11 154		

CMA = Census Metropolitan Areas; CAA = Census Agglomeration Areas

---

share<sup>11,12</sup> all require the availability of hospital CAs. Creating hospital CAs is, however, fraught with difficulties. The many challenges associated with this task are outlined by Thrall and colleagues<sup>4</sup> in an article aptly entitled “Delineating hospital trade areas: It’s practically brain surgery.”

Goody<sup>15</sup> summarizes much of the work performed in defining hospital CAs. The focus is on rural issues in the US. Goody’s article lists a number of authors who have stated that the Metropolitan Statistical Area (MSA–US Census) is an appropriate estimate of market share for an urban area. A number of authors are also listed who claim that the County is an appropriate market area for rural hospitals (although problems with the methodology are also acknowledged).

Goody also explores the role of distance in the choice of facility selected by a client and lists several authors who have uncovered similar evidence. The author also uses utilization data to determine ZIP code assignments to hospital CAs. Cut-off percentages of 60% and 75% have been used to assign a ZIP code to a hospital CA.<sup>15</sup>

It is challenging to apply US findings to Canada because there are so many differences between the 2 countries. ZIP codes and postal codes are quite different, despite their common goal of identifying mailing addresses. In Canada, all facilities are publicly funded and the overall goal is to maximize access to services while minimizing costs. Much medical and population research is performed at the County level in the US, but in Canada counties serve little role in health care administration (with the obvious exception of ambulance services).

In the accompanying paper (p. 195) by Tepper and coworkers,<sup>1</sup> hospital CAs were an essential component of the analysis, since a critical question was “Does the level of service provided by a facility influence the observed rates of surgical procedures?” The facilities were categorized according to the level of service that they provide, but the population served by each facility was unknown, therefore hospital CAs needed to be created to do the research.

### *Alberta catchment areas*

Alberta Health and Wellness created a set of hospital CAs in 1993, which were named General Hospital Districts (GHDs). These were created by examining the road connection, type of facility, capacity, population information, and services provided by each facility at the postal code level. The resulting boundaries contained the population that used the facility within the boundary as the primary hospital.

In 2002, an analysis using Canadian Institute for Health Information (CIHI) admission data for a package of primary care diagnoses was performed to see if these boundaries are still appropriate given changes in many of these facilities. The findings were that most of the facilities serve primarily their own GHDs.

### *Ontario catchment areas*

No GHD-equivalent boundaries were available for Ontario, and therefore a set of hospital CAs was created for Northern Ontario. The rules used to create these boundaries were similar to those used in the original creation of the Alberta GHDs.

The approach was based on amalgamated EAs. Using census boundaries as a foundation reduces the possibility of split populations. EAs surrounding a facility were amalgamated using a combination of travel distances (on roads), postal code assignments, and Voronoi polygon. Boundaries between any 2 polygons are established at the half-way point between 2 facilities using linear distances.<sup>14</sup>

Isochrones were created for each facility for a variety of travel times (15, 30, 45, 60, 90 min, and 2, 3, 4 h). The isochrones for each category were compared facility-by-facility in context of the surrounding EAs. The assignment of postal codes to EAs is often one-to-many, in other words, a single postal code may be assigned to more than one EA. These assignments were examined carefully to reduce the possibility of a postal code being assigned to EAs in different CAs.

Voronoi polygons were used to create regions surrounding each facility based on straight-line (crow-fly) distances. These were used as a general guide in southern facilities and in order to determine flight travel times† in northern facilities. The EAs within each Voronoi polygon were merged to form a first draft of the GHDs. The isochrones and utilization data were then used to refine these boundaries and thus change the membership of the associated EAs. The resulting GHDs were created by amalgamating adjacent EAs based on crow-fly distances and then adjusted using isochrones and utilization data.

Postal code admission data for the same package of primary care diagnoses were obtained from CIHI and used to adjust the boundaries and create the final GHDs.

---

†Remote communities are located far away from larger health facilities. Health services are often obtained using airplanes as transport rather than personal vehicles. Care was exercised to avoid using isochrones in locations where they were not appropriate.

---

For a graphic description of the final CAs see the companion paper (p. 195) by Tepper and coworkers.<sup>1</sup>

### *Calculation of distances*

Most spatial analysis, including distance calculations, are performed using a Geographic Information System (GIS).<sup>15</sup> A GIS is a combination of software, hardware and data designed to display, store, create and analyze geographic data. Alternatives to GIS are time-consuming. However, most standard GIS packages are poorly suited to provide a variety of distance estimates without specific add-on software, and thus the default options are often used as the only distance estimate. The default options that are described below include: crow-fly, road network, time travel analysis, and isochrones or drivetimes.

#### **1. Crow-fly distances**

The default option in all GIS is to calculate distances without any barriers in any direction. A travel distance of 50 km is simply a circle centred on the starting point with a radius of 50 km.

Crow-fly distance can be calculated in several manners. Several GIS offer the option to calculate distances based on projected coordinates or on great distance routes. The projected (or cartesian) option assumes that the portion of the world being examined has been projected onto a flat x-y plane. The characteristics of this plane are controlled by the selection of projection.

An alternative to this option is the use of spherical methods to calculate distances. In this case, the calculations are based on the shortest travel route and are thus better estimates of distance over long distances. The differences in calculated distances for the 2 methods are small for short distances, which are typically the most relevant distances for health facility access research. A more detailed description of the differences and alternative methods has been published.<sup>16</sup>

The principal advantage of crow-fly distances lies in its computational simplicity. The disadvantage is that, in reality, people follow road networks to access care (or other services) and thus these distances may not reflect the true accessibility for a given location with unique characteristics. For example, Fort McMurray, Alta., has a single highway to connect it to the rest of the province. Any access calculations that reflect a distance of more than 50 km will not be a proper representation of the access of this community. Crow-fly distances

may also be particularly inaccurate where natural geography provides barriers to routine road development, such as large bodies of water.

Even in conditions with good road access the crow-fly approach can have significant limitations. Taber, Alta., has good road access in all directions, and the crow-fly approach is illustrated in Fig. 1. However, in reality, the quality of the roads vary due to the use of construction materials and to the road width. These factors determine the maximum speed at which the roads may be safely travelled. Figure 1 also illustrates a modification of the circle based on such considerations and the use of drive-time zones (explained below).

#### **2. Road network distances**

The road network approach to calculating distance utilizes the real travel distances on the existing road network. A barrier is assumed to be present if there are gaps or overlaps at any intersection. Any gaps in the road network will be reflected by the calculations performed using the network. The road network analysis takes into account transportation barriers, and alternative distances calculations assume that there is always a road present to link any community to another.

The ability to calculate road network distances is typically not available in most GIS, but add-on modules can be purchased to allow the user such functionality. Add-on packages are available for ArcView, ArcGIS, MapInfo and other platforms. Also needed are road networks geographic files. Special care is needed with these files to ensure that all roads are perfectly connected at the intersections. The calculation of road network distances is rarely used because of problems with the data (availability, cost and quality) and limited access to the software.

#### **3. Travel time analysis**

Estimated travel times are based on road network distances. Travel time can be obtained after performing road network analysis and by using the speed limits on every road segment. The default analysis is the shortest route between any 2 points. However, most of the software modules also allow for the calculation of the quickest route as long as the speed limit has been entered for every road segment in the network. The speed limits used in the accompanying papers by Tepper and coworkers and by Iglesias and colleagues<sup>1,2</sup> are shown here in Table 2. These assignments result in a conservative estimate, which is



essential since these estimates must not reflect travel time under ideal circumstances, but rather average-to worst-case conditions.

Our methodology used travel time analysis both to define the urban population surrounding urban centres as well as to measure the distance for those rural patients obligated to travel for testing, consultation and surgery.

#### 4. Isochrones (drivetime zones)

Analysis of access to services will require an analysis of distances from all possible sources to all possible service centres. An alternative is to create isochrones (drivetime zones) around each of the service centres. GIS analysis can then be used to determine the status of each origin point against the service isochrones.

In a simple scenario, a speed of 80 km/h could be assumed to create a circle around Taber, Alta. Figure 2 shows the 15-min drivetime zone using speed limits and accounting for intersections. The starting point is at the intersection of Highway 3 and Hwy. 36.

The compression in the northwest zone of the isochrone exists because the virtual driver must cross the entire town at slow speed with a large number of intersections. The shape stretches on the main highways due to their higher speed limits.

As the drivetime is increased to 60 min, the

region takes a diamond-shape in more densely populated areas (Fig. 3). This map shows compression on the west side, which is a result of crossing through Lethbridge and the fact that the main highway (#3) veers north and then west again. The shape of the isochrones provides visual evidence of the road connectivity in every direction. In Northern Ontario, the patterns are similar.

The use of isochrones provides an efficient method to determine the travel time estimates from service centres to large numbers of potential client communities. Isochrones can be determined for every hospital or service of interest. The patterns in each community are determined by road availability near the community. The isochrones account for the Canada–US border by incorporating estimations of the time required to clear customs.

The use of road networks requires more effort than simple straight-line calculations, but the results provide a better reflection of the road network pat-

Type of road	Speed limit, km/h
Large highways	110
Other primary highways	100
Secondary paved highways	60
Arterial roads	60
Streets	50

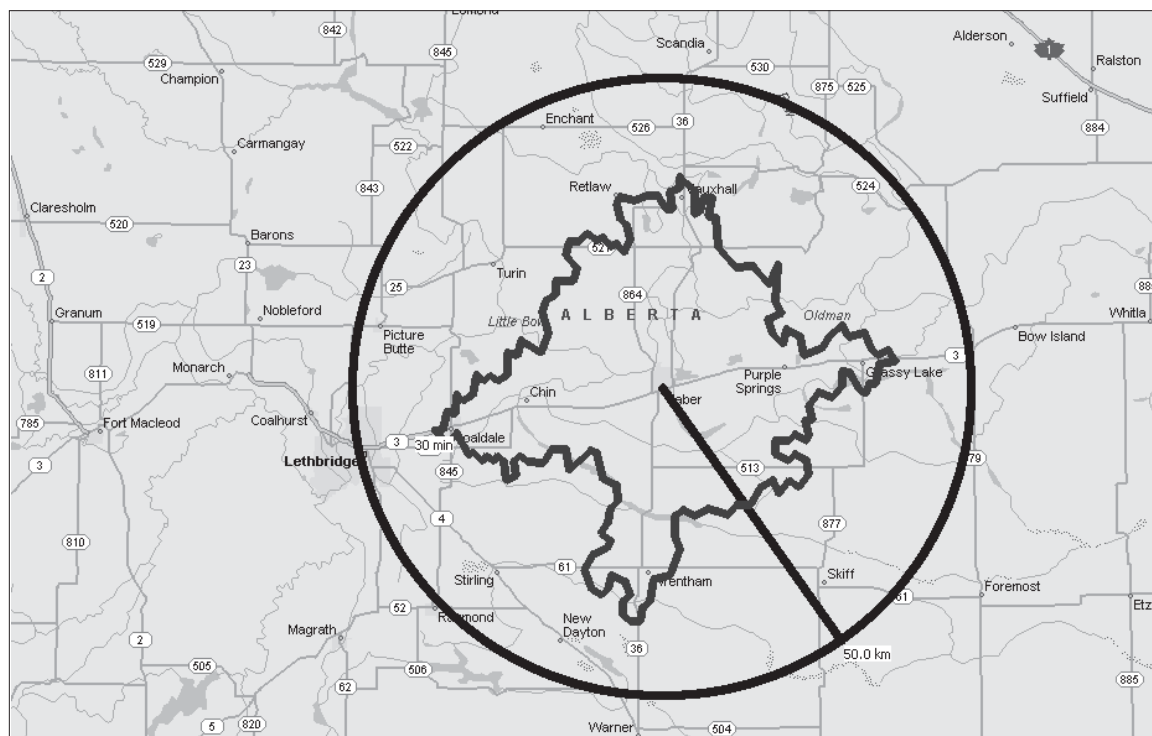


Fig. 1. Comparison of crow-fly (50 km radius) and drivetime (30 min) travel distance for Taber, Alta.



terns that patients will need to follow in order to gain access to health services.

### Limitations

Our definition of “rural” required us to choose some arbitrary distance/drivetimes. Beyond these we would expect to see individuals seeking/requiring procedural care to access it through a rural hospital, rather than travelling directly to an urban clinic or emergency department. For those of us who have worked in rural Canada, the choice of a 60:30-min drivetime for Metropolitan/Regional hospitals made sense on an intuitive level. Our validation exercise for our CAs using CIHI separation data seemed to validate this drivetime: the patients outside the 60:30 drivetime did attend the local rural hospitals for their primary care. However, we did no sensitivity testing. It is possible that by making changes in the 60:30 rule we might have altered our findings.

Our CAs represent boundaries that are impossible to measure accurately. In reality, rural citizens “belong” to a hospital CA because of their perception of where their point of entry into the health care system might be, and not because of a drivetime zone. Depending on a variety of issues, most particularly the complexity and severity of the clinical problem, this point of entry will be different between persons from the same location. It will also be different for the same person with a spectrum of clinical illnesses. CAs, at best, represent approximations of the person-by-person resolution of these issues.

Isochrone analysis assumes that people will behave consistently throughout the year. The travel times outlined in this analysis were based on a yearly average. These travel times will vary within the year, based on season and weather. Another limitation is the accuracy of the speed limits, stop signs, and traffic lights used in the road network file. Our specifics were validated by comparison with Microsoft Map Point. Finally, isochrone analysis assumes that travel will occur by road, whereas it sometimes occurs by air. Our analysis used “>3 hours” as a highest category. For most remote communities, the total time of connecting to an airport, flying time and connecting to a referral hospital is >3 hours.

### CONCLUSION

This methodology represents a durable and portable designation of “rural” with potential for research applications in other areas of health research. By

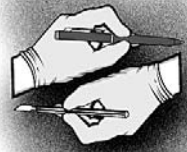
defining urban rather than rural, we avoided many of the methodological conundrums in this research field. For population-based analyses, we have proposed a methodology for constructing CAs attached to Rural, Regional and Metropolitan services. Finally, we have developed a model for calculation of travel time for patients required to travel for care. We successfully applied these methodologies to the disparate regions of rural Alberta and Northern Ontario in a study of rural surgical services.<sup>2</sup>

**Competing interests:** None declared.

*This article has been peer reviewed.*

### REFERENCES

1. Tepper J, Pollett W, Yan J, et al. Utilization rates for surgical procedures in rural and urban Canada. *Can J Rur Med* 2006;11(3):195-203.
2. Iglesias S, Tepper J, Ellehoj E, et al. Rural surgical services in two Canadian provinces. *Can J Rur Med* 2006;11(3):207-17.
3. Pitblado JR, Pong R. Geographic distribution of physicians in Canada. Sudbury: Centre for Rural and Northern Health Research, Laurentian University; 1999.
4. Thrall G, Borden E, Thrall S. Delineating hospital trade areas: It's practically brain surgery. *Geospatial Solutions* July 2002. Available: [www.geospatial-online.com/](http://www.geospatial-online.com/) (accessed 2006 June 12).
5. Iglesias S, Saunders LD, Tracy S, et al. Appendectomies in rural hospitals: safe whether performed by specialist or GP surgeons. *Can Fam Physician* 2003;49:328-33.
6. Iglesias S, Jones L. Rural surgical programs in Western Canada. *Can J Rur Med* 2002;7:103-7.
7. Soret S, McCleary K, Rivers P, et al. Understanding health disparities through geographic information systems. In: Khan O, Skinner R, editors. *Geographic information systems (GIS) and health applications*. Hershey (PA): Idea Publishing Group; 2003. p.12-42.
8. Luo W, Wang F. Spatial accessibility to primary care and physician shortage area designation: a case study in Illinois with GIS approaches. *Environ Plann B Plann Des* 2003;30:865-84.
9. Lin G. Using GIS to unveil distance effects on hospitalizations in Victoria. In: Khan O, editor. *GIS applications in health*. Hershey (PA): Idea Group Publishing; 2003. p. 243-59.
10. Mooney C, Zwanziger J, Phibbs C, et al. Is travel distance a barrier to veterans' use of VA hospitals for medical surgery care? *Soc Sci Med* 2000;50:1743-55.
11. Wolarski E. Using GIS with publicly available data for hospital market share analysis. In: Khan O, editor. *GIS applications in health*. Hershey (PA): Idea Group Publishing; 2003. p. 279-88.
12. Gesler W, Meade M. Locational and population factors in health care-seeking behaviour in Savannah, Georgia. *Health Serv Res* 1988; 23:443-62.
13. Goody B. Defining rural hospital markets. *Health Serv Res* 1993;28: 183-200.
14. Okabe A, Boots B, Sugihara K, et al. *Spatial tessellations: concepts and applications of Voronoi diagrams*. Hoboken (NJ): John Wiley and Sons; 1992.
15. Burrough PA, McDonnell RA. Principles of geographical information systems. Oxford University Press; 1988. p. 132-61.
16. Ellehoj EA, Schopflocher D, et al; for the Health Surveillance Branch, Alberta Health and Wellness. *Calculating distances in Alberta*. Alberta Health and Wellness Geographic Methodology Series, no 4. 2004. Available: [www.health.gov.ab.ca/resources/publications/GeoDistances.pdf](http://www.health.gov.ab.ca/resources/publications/GeoDistances.pdf) (accessed 2006 June 12).



## ORIGINAL ARTICLE ARTICLE ORIGINAL

# Utilization rates for surgical procedures in rural and urban Canada

*Joshua Tepper, MD*

*Institute of Clinical  
Evaluative Sciences,  
Toronto, Ont.*

*William Pollett, MD*

*Professor and Chair  
of the Discipline of Surgery,  
Memorial University  
of Newfoundland, St. John's,  
Nfld.*

*Yan Jin, MA*

*Research and Evidence  
Branch, Alberta Health  
and Wellness*

*Erik Elleboj, PhD*

*Research and Evidence  
Branch, Alberta Health  
and Wellness*

*Peter Hutten-Czapski,  
MD*

*Assistant Professor,  
Northern Ontario School  
of Medicine*

*Don Schopflocher, PhD*

*Health Surveillance Branch,  
Alberta Health and Wellness*

*Brendan Barrett, MB*

*Professor of Medicine,  
Memorial University  
of Newfoundland, St. John's,  
Nfld.*

*Stuart Iglesias, MD*

*Rural Family Physician,  
Gibsons, BC*

*Correspondence to:  
Dr. Joshua Tepper, Institute  
of Clinical Evaluative  
Sciences, G-106 2075  
Bayview Ave., Toronto ON  
M4N 5M5*

*This article has been peer  
reviewed.*

*See also Editorial page 185,  
and accompanying articles,  
pages 187 and 207.*

**Objective:** To investigate whether utilization rates of common surgical procedures are different between urban and rural Canadians in 2 provinces and to examine whether these rates are influenced by the presence and scope of local surgical programs and by the availability of different physician providers.

**Methods:** Utilization rates for 8 common surgical procedures (appendectomy, carpal tunnel release, closed hip fracture repair, rectal cancer surgery, joint replacement, thyroidectomy, unilateral or bilateral inguinal herniorrhaphy, and cholecystectomy) were identified in rural Alberta and rural Northern Ontario from hospital discharge records. Rural populations were characterized by 3 types of communities, based on availability of local physician and diagnostic resources. Travel time for consultations and surgery were estimated. Age–sex-adjusted rates, their standard errors, and 95% confidence intervals (CIs) were calculated for the purpose of comparisons among residents' locations using the method of direct standardization. To test a possible association between travel times and utilization rates, hierarchical linear and nonlinear modelling was used to analyze a 2-level model, with patients nested within rural hospital catchment areas in the province of Alberta.

**Results:** Utilization rates for appendectomy, cholecystectomy and carpal tunnel release are significantly greater for rural populations compared with urban in both Alberta and Northern Ontario. Rural Northern Ontario had higher rates of utilization than rural Alberta for carpal tunnel release and cholecystectomy ( $p < 0.01$ ) and closed hip fracture repair ( $p < 0.05$ ). No statistical differences between the provinces were noted for the remaining procedures. No difference in utilization rates was found between the 3 types of rural centres. The modelling found a significant association between travel time and use for only one procedure — carpal tunnel release. Patients who had to travel  $\leq 1$  hour had a 13% higher surgery rate.

**Conclusion:** Rates of utilization were higher in rural areas for procedures where greater surgical variability is known to exist. These higher rural rates were not influenced by either the presence or scope of local surgical programs nor by the differences in providers. There was no difference in rates for procedures where previous research has shown little variability.

**Objectif :** Déterminer si les taux d'utilisation des interventions chirurgicales courantes sont différents entre les milieux urbains et ruraux dans deux provinces du Canada et si la présence et l'envergure de programmes locaux de chirurgie et la disponibilité de différents médecins prestataires ont une influence sur ces taux.

**Méthodes :** On a déterminé, à partir de dossiers de congé d'hôpital, les taux d'utilisation de huit interventions chirurgicales courantes (appendicectomie, libération du nerf médian au niveau du canal carpien, réduction fermée d'une fracture de la hanche, chirurgie pour cancer du rectum, arthroplastie, thyroïdectomie, herniorrhaphie inguinale unilatérale ou bilatérale et cholécystectomie) en milieu rural, en Alberta et dans le nord de l'Ontario. On a caractérisé les populations rurales en fonction de trois types de communauté et de la disponibilité locale d'un médecin et de services de diagnostic. On a estimé le temps de déplacement pour les consultations et l'intervention chirurgicale. On a utilisé la normalisation directe pour calculer les taux corrigés en fonction de l'âge et du sexe, de leur écart type et de leur intervalle de confiance (IC) à 95 % afin d'établir des comparaisons entre les lieux de résidence des patients. Afin de déterminer s'il y a un lien possible entre la durée des déplacements et les taux d'utilisa-

tion, on a utilisé une modélisation linéaire et non linéaire hiérarchique pour analyser un modèle à deux niveaux, les patients étant intégrés à des bassins hospitaliers ruraux en Alberta.

**Résultats :** Les taux d'utilisation de l'appendicectomie, de la cholécystectomie et de la libération du nerf médian au canal carpien sont significativement plus élevés dans les populations rurales que dans les populations urbaines, tant en Alberta que dans le nord de l'Ontario. Les milieux ruraux du nord de l'Ontario affichaient des taux plus élevés d'utilisation que ceux de l'Alberta dans le cas de la libération du nerf médian au canal carpien et de la cholécystectomie ( $p < 0,01$ ), ainsi que dans celui de la réduction fermée de fractures de la hanche ( $p < 0,05$ ). On n'a constaté aucune différence statistique entre les provinces pour les autres interventions et aucune différence au niveau des taux d'utilisation entre les trois types de centres ruraux. La modélisation a révélé un lien important entre la durée des déplacements et l'utilisation dans le cas d'une intervention seulement — la libération du nerf médian au niveau du canal carpien. Les patients qui devaient se déplacer moins d'une heure présentaient un taux d'intervention chirurgicale plus élevé de 13 %.

**Conclusion :** Les taux d'utilisation étaient plus élevés dans les régions rurales dans le cas des interventions où l'on sait qu'il existe une variabilité chirurgicale plus importante. Ni la présence ou l'envergure de programmes locaux de chirurgie, ni les différences entre les prestataires, n'ont eu d'effet sur ces taux ruraux plus élevés. Les taux d'intervention qui présentaient peu de variabilité selon les recherches antérieures ne montraient aucune différence.

## INTRODUCTION

The provision of surgical services to rural and remote areas of Canada presents several challenges. First, the provision of smaller, rural, surgical programs is expensive and there is a perception, not documented, that provincial regionalization and restructuring initiatives have seen the closure of many rural surgery programs for financial and administrative reasons. Second, specialist general surgeons have been in short supply (Dr. John Ruedy, Dean of Medicine [1992–99], Dalhousie University: unpublished data, 1998) and there is a lack of consensus on the appropriate role for non-specialist physicians, including family physicians, in the provision of surgical care. There is also a perception that current general surgery training programs prepare their graduates for urban sub-specialty practices rather than for a rural generalist setting. The recommendation that on-call responsibilities should not exceed 1-in-5 requires that services be provided by groups of providers.<sup>1</sup> Third, technological advances such as minimally invasive surgery and the large role of CT scanning in general surgery might encourage the centralization of these services in urban centres.

Surgical services in rural and remote Canada have been provided by physicians with different training backgrounds i) Canadian-certified general

surgeons, ii) international medical graduates with an advanced level of surgical training, usually a foreign fellowship, and iii) family physicians with additional postgraduate surgical training who can offer a limited skill set (e.g., appendectomy, herniorrhaphy, cesarean section).<sup>2</sup> Canada's provinces and territories vary in their use of these different providers.<sup>3</sup>

Our research study investigated whether the utilization rates of 8 common surgical procedures are different between urban and rural Canadians. We chose 2 provinces — Alberta and Ontario, specifically Northern Ontario — each with a large geography and significant rural populations, but different approaches to the delivery of surgical services. Northern Ontario relies almost exclusively on Canadian-certified general surgeons, often recruiting and supporting them with Alternative Payment Plans, in surgical groups located in several medium- and large-sized rural centres. Alberta relies on a blend of all 3 physician provider groups, distributed in a significantly larger number of rural surgical programs sometimes located in centres smaller than the rural surgical centres in Northern Ontario.<sup>3</sup>

Our research gave us the opportunity to contrast these systems and to ask whether utilization rates might be affected by these differences. It was also an opportunity to determine if there is an association between utilization rates and either the avail-

ability of local diagnostic and surgical services in rural Canada and/or the distance travelled by rural patients to access these services.

## METHODS

### Data sources

Both Alberta Health and Wellness and the Institute for Clinical Evaluative Sciences (located in Ontario) were partnered with the research team. The following databases were accessed in-house by the respective provincial agencies.

#### Alberta

- Discharge Abstract Database (DAD): summarizes clinical care provided to each hospital patient admitted for an overnight stay
- Ambulatory Care Classification System: an abstract of the clinical care provided as outpatient services
- Alberta Health Care Insurance Plan: provides patient birth date, sex and postal codes

#### Ontario

- DAD
- Same Day Surgery (SDS): an abstract of the clinical care provided as outpatient services
- Registered Persons Database: from the Ontario Health Insurance Program, it provided patient age, sex and postal codes

### Data extraction criteria

1. Using the DAD and SDS databases the procedures of interest were selected based on the clinical modification of the *International Classification of Diseases*, 9th revision (ICD-9-CM) databases (Appendix 1).
2. Only one unique procedure per person was included. If more than 1 of the **same** procedure was found for the **same** individual (e.g., 2 carpal tunnel releases, 2 closed hip fracture repairs) only the first surgical procedure record and its attendant information were included.
3. A resident with a non-urban postal code was defined as a non-urban resident. A non-urban postal code was defined as a place 60 min in travel time from a tertiary care centre, or 30 min in travel time from a regional centre (60:30 rule).
4. Age–sex-adjusted rates, their standard errors,

and 95% confidence intervals (CIs)<sup>1</sup> were calculated for the purpose of comparisons among residents' locations using the method of direct standardization. The standard population for the adjusted rates was the population of Alberta on Sept. 30, 1999 (the mid-point of the study period). In Alberta, the population used in age–sex–region specific rates was from the Alberta Health Care Insurance Plan registry database. In Ontario, the population was from the intercensal estimates using the 1996 census data.

5. T-square statistics developed by Carriere and Roos<sup>4</sup> were computed for comparing rates, and 95% CIs were provided in the tables.

### Level of surgical services

#### 1. Hospital catchment areas

All of the acute care hospitals in Alberta and Northern Ontario were assigned unique hospital catchment areas. This allowed each patient undergoing a procedure to be mapped by postal code to the hospital where she or he resided, regardless of where he or she actually received the surgical care. For a detailed description of this methodology the reader is referred to the companion paper by Ellehoj and colleagues (p. 187).<sup>5</sup>

#### 2. Surgical services

Service characteristics for each acute care facility were used to characterize hospital catchment area polygon residents into 5 levels of surgical service categories: Metropolitan, Regional, Rural A, Rural B and Rural C.

##### i) Metropolitan catchment areas

A Metropolitan centre includes at least 1 tertiary care facility associated with a local medical school. In Alberta, these are in Edmonton and Calgary. At the time of the study, Northern Ontario did not have a tertiary care centre with a local medical school. We used London, Ont., in Southwestern Ontario as our reference Metropolitan population for Northern Ontario. All hospitals within a 60-min drivetime of the Academic Health Sciences Centres are included in the Metropolitan catchment area.

##### ii) Regional catchment areas

Regional catchment area residents have local access to all of the study procedures and to a full comple-

ment of diagnostic technologies associated with these procedures (fluoroscopy, endoscopy, ultrasound, electromyography). The only exception is the Northern Lights Regional Health Centre in Fort McMurray, Alta., where joint replacement and repair of closed hip fracture are not offered locally.

Alberta's Regional centres are Fort McMurray, Grande Prairie, Red Deer, Lethbridge and Medicine Hat. Northern Ontario's Regional centres are Thunder Bay, Sault Ste. Marie, Sudbury, North Bay and Timmins. All hospitals within a 30-min drive of these facilities are included within a Regional catchment area.

### iii) Rural A, rural B and rural C

A Rural facility represented all acute care facilities outside the Regional and Metropolitan centres. The defining characteristic was the provision of most or all of the local medical services by family physicians.

The definitions of the 3 rural facility groupings: Rural A (RA), Rural B (RB) and Rural C (RC) were based on a survey completed in Western Canada between May and September of 2000.<sup>6</sup> This survey was sent by mail or email to the facility administrator or a member of the surgical staff of all the rural acute care facilities providing surgical services in Manitoba, Saskatchewan, Alberta and British Columbia. (These facilities were defined as having provided at least one appendectomy or cesarean section during the 1996/97 fiscal year in the DAD file.) The survey respondent was asked to describe the type of surgery performed in the facility, available diagnostic services, and physician availability and training. Based on these responses the definitions of RA, RB and RC were created (Appendix 2).

In Northern Ontario, similar hospital service characteristics were collected by a telephone survey to the rural facilities that provided local surgical services.

### iv) Travel time

A set of procedure-specific travel webs was created that anticipated the most likely referral centre for consultation, diagnostic testing and surgery for each of the rural facilities in both provinces. In most instances this represented the closest referral facility by road access. When the anticipated referral centre was not obvious, a telephone survey completed the travel web.

For some procedures — appendectomy, closed hip fracture repair — patients only travel once. For

other procedures, rural patients might travel 2 (joint replacement) or 3 times (carpal tunnel release), depending on the local services available. Our travel time variable became the destination specific travel time multiplied by the number of expected trips.

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

## RESULTS

### 1. *Between-province comparison of utilization rates*

Rural Northern Ontario had higher rates of utilization than rural Alberta for carpal tunnel release and cholecystectomy ( $p < 0.01$ ) as well as closed hip fracture repair ( $p < 0.05$ ). No statistical differences between the provinces were noted in the remaining areas (Table 1).

In a comparison of urban areas, Northern Ontario had higher rates for several procedures, including carpal tunnel release, closed hip fracture repair, joint replacement, unilateral or bilateral inguinal herniorrhaphy, and cholecystectomy ( $p < 0.01$ ). Urban Alberta had higher rates only for thyroidectomy ( $p < 0.05$ ). There was no statistical difference in urban areas for appendectomy (Table 2).

### 3. *Within-province comparison of rural and urban populations*

Appendectomy, cholecystectomy and carpal tunnel release utilization rates are significantly greater for rural populations in both Alberta and Northern Ontario ( $p < 0.01$ ). In Alberta the rural utilization rates for joint replacement are higher in rural areas ( $p < 0.01$ ). In Northern Ontario there were no differences between the rural and urban populations for joint replacement (Table 2).

For closed hip fracture repair, rectal cancer surgery, thyroidectomy, and unilateral or bilateral inguinal herniorrhaphy there are no differences in the utilization rates between rural and urban populations within a province (Table 2).

### 2. *Within-province comparison of different local surgical service levels*

In Alberta, differences in rates based on local surgical services were identified for 5 procedures: appendectomy, carpal tunnel release, joint replacement, cholecystectomy (all  $p < 0.01$ ) and unilateral or bilateral inguinal herniorrhaphy ( $p < 0.05$ ). For

these procedures utilization rates were significantly lower in at least 1 of the urban centres (i.e., either Edmonton or Calgary). There were no differences between the different rural areas (RA, RB, RC) or regional centres. (Table 3).

In Ontario, carpal tunnel release and cholecystectomy rates were lower in the urban centre ( $p < 0.01$ ). London, Ont., also had lower utilization rates for appendectomy and for unilateral or bilateral

inguinal herniorrhaphy ( $p < 0.05$ ). Similar to Alberta, there were no statistically significant differences in utilization rates between the 3 types of rural communities or in comparison to the regional centres in Northern Ontario (Table 4).

Using an F-test of the Alberta and Ontario T-squared statistics, we tested how the variation in utilization rates among the populations residing in Rural, Regional and Metropolitan service centres

**Table 1. Utilization rates\* (and standard deviations) by rural and urban residence: interprovincial comparison**

Procedure, age limit in years	Rural			Urban		
	Alberta	Northern Ontario	T <sup>2</sup>	Alberta	Northern Ontario	T <sup>2</sup>
Appendectomy, ≥ 5	1.20 (1.12–1.29)	1.24 (1.12–1.37)	0.23	1.07 (1.02–1.11)	1.00 (0.94–1.07)	2.40
Carpal tunnel release, ≥ 20	1.39 (1.28–1.50)	1.95 (1.78–2.13)	30.42†	0.83 (0.78–0.87)	1.47 (1.39–1.55)	213.47†
Closed hip fracture repair, ≥ 50	1.44 (1.27–1.63)	1.81 (1.54–2.12)	4.79‡	1.46 (1.36–1.57)	1.73 (1.59–1.87)	9.49†
Rectal cancer surgery, ≥ 50	0.42 (0.33–0.53)	0.45 (0.34–0.60)	0.17	0.44 (0.39–0.50)	0.48 (0.41–0.56)	0.50
Joint replacement, ≥ 40	3.36 (3.15–3.58)	3.21 (2.94–3.51)	0.61	2.90 (2.80–3.02)	3.53 (3.38–3.69)	42.09†
Thyroidectomy, no age limit	0.36 (0.30–0.43)	0.27 (0.20–0.35)	3.17	0.34 (0.31–0.38)	0.29 (0.25–0.33)	4.05‡
Unilateral or bilateral inguinal herniorrhaphy, ≥ 20	1.93 (1.81–2.06)	2.07 (1.90–2.26)	1.73	1.88 (1.82–1.95)	2.27 (2.17–2.38)	41.80†
Cholecystectomy, ≥ 20	3.62 (3.44–3.80)	4.39 (4.13–4.66)	23.35†	2.98 (2.89–3.06)	3.30 (3.17–3.42)	18.23†

SD = standard deviation  
 \*No. of procedures per 1000 population.  
 † $p < 0.01$   
 ‡ $p < 0.05$ .  
 Note: 99.17% confidence intervals for rates (overall  $\alpha = 0.05$ ).

**Table 2. Utilization rates\* (and standard deviations) by province: rural and urban comparison**

Procedure, age limit in years	Alberta			Northern Ontario		
	Rural	Urban	T <sup>2</sup>	Rural	Urban	T <sup>2</sup>
Appendectomy, ≥ 5	1.20 (1.12–1.29)	1.07 (1.02–1.11)	8.17†	1.24 (1.12–1.37)	1.00 (0.94–1.07)	12.09†
Carpal tunnel release, ≥ 20	1.39 (1.28–1.50)	0.83 (0.78–0.87)	116.25†	1.95 (1.78–2.13)	1.47 (1.39–1.55)	27.12†
Closed hip fracture repair, ≥ 50	1.44 (1.27–1.63)	1.46 (1.36–1.57)	0.03	1.81 (1.54–2.12)	1.73 (1.59–1.87)	0.25
Rectal cancer surgery, ≥ 50	0.42 (0.33–0.53)	0.44 (0.39–0.50)	0.19	0.45 (0.34–0.60)	0.48 (0.41–0.56)	0.11
Joint replacement, ≥ 40	3.36 (3.15–3.58)	2.90 (2.80–3.02)	14.53†	3.21 (2.94–3.51)	3.53 (3.38–3.69)	3.44
Thyroidectomy, no age limit	0.36 (0.30–0.43)	0.34 (0.31–0.38)	0.13	0.27 (0.20–0.35)	0.29 (0.25–0.33)	0.29
Unilateral or bilateral inguinal herniorrhaphy, ≥ 20	1.93 (1.81–2.06)	1.88 (1.82–1.95)	0.38	2.07 (1.90–2.26)	2.27 (2.17–2.38)	3.60
Cholecystectomy, ≥ 20	3.62 (3.44–3.80)	2.98 (2.89–3.06)	45.66†	4.39 (4.13–4.66)	3.30 (3.17–3.42)	61.82†

SD = standard deviation  
 \*No. of procedures per 1000 population.  
 † $p < 0.01$   
 Note: 99.17% confidence intervals for rates (overall  $\alpha = 0.05$ ).



differed between the provinces. There were no significant differences between the provinces for any of the 8 procedures.

### 5. Modelling of rural care delivery

Hierarchical linear and nonlinear modelling (HLM 5.05) was used to analyze a 2-level model with patients nested within hospital catchment areas. Because our principal interest was to test the possible association between travel times and utilization rates, we restricted the model to include only the rural population. We tested the modelling exercise using only the Alberta population. At the patient level, age and sex were included as independent variables. At the community level, travel time and level of surgical service (RA, RB, RC) were included. We chose a significance test of  $p < 0.01$  because of multiple associations.

For carpal tunnel release the utilization rate was significantly associated with travel time. Patients who travel  $\leq 1$  hour had a 13% higher surgery rate. No significant associations between travel time and utilization rates were found for the other 7 procedures.

### DISCUSSION

Much of the analytical framework in the literature

derives from Wennberg and Gittelsohn, who hypothesized that variation in surgical rates would be inversely correlated with the accuracy of diagnosis and the efficacy of surgical treatment for any particular morbid condition.<sup>7,8</sup> If there are significant challenges with diagnosis (appendectomy) or discretion in the use of surgical treatment (hysterectomy, tonsillectomy, carpal tunnel release), then greater variation in surgical rates are expected. When the diagnosis is easily made and the appropriateness of surgical therapy is established (cancer surgery, closed hip fracture repair, hernia repair) little variation in surgical rates is anticipated.

Our results for the variation in utilization rates are similar to the international and Canadian literature.<sup>9-15</sup> Both appendectomy and cholecystectomy rates have generally shown significant variability but less so than the extremes of hysterectomy and tonsillectomy.

In the Canadian literature 2 consistent findings emerge.<sup>12-15</sup> First, the utilization rates for the procedures studied are significantly higher among rural populations. Second, the lowest utilization rates are found in Metropolitan centres with teaching hospitals. Our own results are similar for those procedures where differences in utilization rates are found.

Some authors suggest that higher utilization

**Table 3. Utilization rates\* (and standard deviations) by service level of residence, in Alberta**

Procedure, age limit in years	Rural†			Regional‡	Metropolitan§		T <sup>2</sup>
	RA	RB	RC		Edmonton	Calgary	
Appendectomy, $\geq 5$	1.11 (0.90-1.37)	1.27 (1.10-1.46)	1.21 (1.02-1.43)	1.25 (1.10-1.42)	1.13 (1.04-1.23)	0.91 (0.83-1.00)	43.94¶
Carpal tunnel release, $\geq 20$	1.42 (1.15-1.76)	1.43 (1.22-1.68)	1.34 (1.11-1.61)	1.11 (0.95-1.30)	0.83 (0.74-0.92)	0.70 (0.62-0.79)	161.34¶
Closed hip fracture repair, $\geq 50$	1.28 (0.91-1.81)	1.54 (1.20-1.98)	1.40 (1.06-1.85)	1.40 (1.10-1.77)	1.57 (1.35-1.82)	1.40 (1.21-1.63)	3.76
Rectal cancer surgery, $\geq 50$	0.41 (0.22-0.76)	0.40 (0.25-0.66)	0.40 (0.23-0.68)	0.39 (0.24-0.61)	0.44 (0.34-0.58)	0.47 (0.37-0.61)	1.69
Joint replacement, $\geq 40$	3.25 (2.74-3.86)	3.32 (2.91-3.80)	3.43 (2.98-3.95)	3.35 (2.97-3.78)	2.65 (2.43-2.88)	2.99 (2.77-3.23)	32.48¶
Thyroidectomy, no age limit	0.36 (0.23-0.57)	0.35 (0.24-0.50)	0.35 (0.23-0.53)	0.40 (0.29-0.53)	0.30 (0.24-0.36)	0.38 (0.31-0.45)	6.71
Unilateral or bilateral inguinal herniorrhaphy, $\geq 20$	2.07 (1.74-2.46)	1.91 (1.68-2.19)	1.96 (1.69-2.28)	2.12 (1.90-2.38)	1.86 (1.72-2.00)	1.78 (1.65-1.92)	14.24**
Cholecystectomy, $\geq 20$	3.45 (3.00-3.95)	3.64 (3.30-4.02)	3.62 (3.23-4.06)	3.86 (3.55-4.20)	2.82 (2.66-2.99)	2.82 (2.65-2.99)	117.75¶

SD = standard deviation  
 \*No. of procedures per 1000 population.  
 †All acute care facilities outside the Regional and Metropolitan centres.  
 ‡See Methods section for a description of Regional.  
 §Includes at least 1 tertiary care facility associated with a local medical school.  
 ¶ $p < 0.01$   
 \*\* $p < 0.05$ .  
 Note: 99.17% confidence intervals for rates (overall  $\alpha = 0.05$ ).

rates in rural populations represent inappropriate or unnecessary surgery.<sup>12-15</sup> It is equally plausible that urban populations might have restricted access to common low-complexity procedures. These procedures compete in large teaching hospitals with complex province-wide surgical services. It is possible that access is better for certain procedures in rural areas.

Appendectomy, unlike cholecystectomy and carpal tunnel release, is not a discretionary procedure. However, there are several reasons why appendectomy rates may be higher in rural areas. Diagnostic imaging services such as ultrasound and CT scanning are typically less available in rural hospitals, so accurate diagnosis is more difficult. Another traditional management strategy to cope with the challenge of diagnosing appendicitis is to observe the patient over a period of time. However, for the subset of rural patients without local surgical services, and who have travelled a significant distance to an urban hospital, the opportunity to ask the family to wait, out of hospital, for any significant period of time is restricted by issues of accommodation and expense. Similarly, transfer from a rural hospital to an urban setting for diagnostic testing puts the patient at greater risk in some instances (e.g., possible appendicitis).

International literature on rates of urban versus rural joint replacement were reviewed. In Great Britain there is some evidence that osteoarthritis of the hip has a significantly greater incidence in rural populations than in urban ones (101.3/100 000 v. 77.6/100 000).<sup>16,17</sup> The intuitive explanation is the cumulative mechanical stresses on the joint from the more physical occupations in rural areas. In this light, the higher rates for joint replacement in rural Alberta seem appropriate. In addition, Alberta has moved to regionalize orthopedic programs. If this change improves access for rural populations, then higher utilization rates are an expected outcome. This may also explain why higher rates were not seen in rural Northern Ontario, where regionalization of orthopedic services has not occurred.

We found a significant association between the obligation to travel for care and a diminished utilization rate for carpal tunnel release, based on Alberta data. That travel should be associated with surgery in carpal tunnel morbidity, but not in the other procedures, is not surprising. Carpal tunnel release represents the most discretionary of the studied surgeries, and there are acceptable alternative medical therapies (e.g., orthotics, steroids, physiotherapy, rest).

Furthermore, whereas the equipment for diag-

**Table 4. Utilization rates\* (and standard deviations) by service level of residence, in Northern Ontario**

Procedure, age limit in years	Rural†			Regional‡	Metropolitan§	T <sup>2</sup>
	RA	RB	RC		London, Ont. ¶	
Appendectomy, ≥ 5	1.35 (1.09-1.67)	1.11 (0.77-1.59)	1.13 (0.87-1.48)	1.02 (0.90-1.15)	1.02 (0.92-1.14)	10.06**
Carpal tunnel release, ≥ 20	1.80 (1.46-2.22)	1.81 (1.32-2.48)	1.85 (1.47-2.32)	1.80 (1.63-1.99)	1.30 (1.17-1.44)	44.31††
Closed hip fracture repair, ≥ 50	1.72 (1.23-2.41)	1.68 (0.92-3.06)	2.24 (1.58-3.16)	1.82 (1.56-2.13)	1.64 (1.43-1.88)	5.28
Rectal cancer surgery, ≥ 50	0.29 (0.13-0.65)	0.44 (0.17-1.17)	0.56 (0.29-1.07)	0.51 (0.38-0.68)	0.44 (0.33-0.58)	3.74
Joint replacement, ≥ 40	2.76 (2.23-3.40)	3.45 (2.56-4.66)	3.34 (2.70-4.14)	3.51 (3.21-3.83)	3.57 (3.31-3.85)	9.30
Thyroidectomy, no age limit	0.24 (0.13-0.45)	0.22 (0.08-0.60)	0.23 (0.11-0.47)	0.31 (0.24-0.40)	0.28 (0.22-0.35)	2.35
Unilateral or bilateral inguinal herniorrhaphy, ≥ 20	2.15 (1.78-2.59)	1.80 (1.32-2.45)	1.97 (1.59-2.45)	2.14 (1.96-2.34)	2.39 (2.22-2.57)	12.55**
Cholecystectomy, ≥ 20	4.50 (3.94-5.14)	5.55 (4.61-6.67)	4.05 (3.46-4.73)	3.48 (3.25-3.74)	3.20 (3.00-3.41)	82.68††

SD = standard deviation

\*No. of procedures per 1000 population.

†All acute care facilities outside the Regional and Metropolitan centres.

‡See Methods section for a description of Regional.

§Includes at least 1 tertiary care facility associated with a local medical school.

¶At the time of the study, Northern Ontario did not have a tertiary care centre with a local medical school; therefore, London, Ont., in Southwestern Ontario was used as reference.

\*\* $p < 0.05$

†† $p < 0.01$

Notes: 99.17% confidence intervals for rates (overall  $\alpha = 0.05$ ). The Bonferroni method<sup>5</sup> was used to calculate confidence intervals for multiple comparisons.

nosing all of the procedures for which we found variation in utilization rates is potentially available in many rural surgical programs (e.g., ultrasound for appendicitis or cholecystitis), the electromyogram testing for carpal tunnel entrapment is available only in Regional or Metropolitan centres. This then presents travel issues.

The lack of significant association between utilization and the presence or absence of local surgical programs in rural communities (i.e., RA v. RB v. RC) in either province is reassuring.

### *Limitations*

Our data on utilization rates included only those procedures performed within the province of residence. Where patients travelled out of province, those procedures were not included in our database. This is a particular problem in Northern Ontario, where referral to Winnipeg, Manitoba, for major surgery occurs on a regular basis. Utilization rates for these procedures by Northern Ontario residents will be underestimated.

Rates were standardized for age and sex but these do not necessarily capture underlying differences in need among the population. Furthermore, levels of utilization are not linked to assessment of outcomes. Future work might assess outcomes such as complication rates, length of stay and patient satisfaction. Additional work might also consider a cost-benefit analysis of different surgical systems.

Our attempts to build a model using a measure of local surgical services and travel time had several weaknesses. The model was based only on Alberta data, which reduced our sample size. We relied on survey data to assign our RA/RB/RC designation of "local surgical services." Even with perfect accuracy in our response, it is possible that this designation might have changed during the 4-year study period. Furthermore, our travel webs were *anticipated* referral patterns based on survey data rather than *actual* patient travel. Most of our survey respondents were quite frank that several referral possibilities were considered for each patient, and the final choice reflected bed availability, wait lists, weather, and patient and physician preferences. It is possible that a travel variable built on actual travel obligations might be a more powerful explanatory variable in our model.

Our original research interest represented an inquiry into whether rural patients might have restricted access to common surgical procedures. Consequently, our modelling exercise included

issues such as local services and travel that might influence rural access. Now that it is clear that rural utilization rates for some procedures are actually higher, it is regrettable that we did not make any effort in our model to ask why urban residents might have diminished access to these procedures — for example, restricted access to family physicians, restricted supply of generalist general surgeons, or longer surgical wait lists.

### **CONCLUSIONS**

Cholecystectomy, carpal tunnel release, appendectomy and joint replacement were performed at higher rates in rural Northern Ontario and Alberta populations than urban. This variation is consistent with previous findings. For other procedures — unilateral or bilateral inguinal herniorrhaphy, closed hip fracture repair, cancer (rectal cancer surgery and thyroidectomy), where utilization rates are known to show little variation, the rates for rural and urban residents are similar.

For one procedure, carpal tunnel release, we found an association between longer travel times and diminished utilization rates. One hour of travel time was associated with a 13% decrease in utilization ( $p < 0.01$ ). For the remaining 7 procedures there was no significant association between travel time and utilization.

We found no significant association between utilization and the presence and scope of surgical services available locally to rural communities.

**Acknowledgements:** We acknowledge Corrine Truman and Dr. Keith MacLellan, both of whose contributions were invaluable. We acknowledge the significant contributions of Deanna Rothwell and Ping Li, Institute of Clinical Evaluative Sciences, and Kir Luong and Sylvia A. Wilson, Alberta Health and Wellness (AHW). And we acknowledge the valuable contributions made by Ms. Jill Strachan from the Canadian Institute for Health Information. We gratefully acknowledge the support provided by AHW and thank Health Canada for its financial support.

In compiling this article, the researchers have relied upon data supplied, in whole or in part, by AHW. AHW does not review or control the content or accuracy of this article or its findings, nor does AHW warrant the accuracy or completeness of this article or its findings. AHW assumes no legal liability, whether direct or indirect, for the information in this article.

**Competing interests:** None declared.

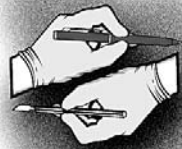
### **REFERENCES**

1. Pollett WG. Presidential address 1999. The future of surgery — Santayana or Ford [CAGS Presidential Address]. *Can J Surg* 2000;43:347-52.

2. Iglesias S, Saunders LD, Tracy S, et al. Appendectomies in rural hospitals: safe whether performed by specialist or GP surgeons. *Can Fam Physician* 2003;49:328-33.
3. Iglesias S, Tepper J, Ellehoj E, et al. Rural surgical services in two Canadian provinces. *Can J Rural Med* 2006;11(3):207-17.
4. Carriere KC, Roos LL. Comparing standardized rates of events. *Am J Epidemiol* 1994;140:472-82.
5. Ellehoj E, Tepper J, Barrett B, et al. Research methodology for the investigation of rural surgical services. *Can J Rural Med* 2006;11(3):187-94.
6. Iglesias S, Jones LC. Rural surgical programs in Western Canada. *Can J Rural Med* 2002;7(2):103-7.
7. Wennberg JE, Gittelsohn A. Small area variations in health care delivery. *Science* 1973;182:1102-8.
8. Wennberg JE, Gittelsohn A. Variations in medical care amongst small areas. *Sci Am* 1982;246:120-34.
9. McPherson K, Wennberg JE, Hovind OB, et al. Small area variations in the use of common surgical procedures: an international comparison of New England, England, and Norway. *N Engl J Med* 1982;307:1310-4.
10. Barnes BA, O'Brien E, D'Arpa DG, et al. Report on variation in rates of utilization of surgical services in the Commonwealth of Massachusetts. *JAMA* 1985;254(3):371-5.
11. Keller RB, Largay AM, Soule DN, et al. Maine carpal tunnel study: small area variations. *J Hand Surg* 1998;23A:692-6.
12. Stockwell H, Vayda E. Variations in surgery in Ontario. *Med Care* 1979;17:390-6.
13. Roos N, Black C, Wade J, et al. How many general surgeons do you need in rural areas? Three approaches to physician resource planning in southern Manitoba. *CMAJ* 1996;155:395-401.
14. Hall RE, Cohen MM. Variations in hysterectomy rates in Ontario: Does the indication matter? *CMAJ* 1994;151:1713-9.
15. Blais R. Variations in surgical rates in Quebec: Does access to teaching hospitals make a difference? *CMAJ* 1993;148:1729-36.
16. Willes CE, Kee F, Beverland D, et al. Urban-rural differences in total hip replacements: the next stage. *J Publ Health Med* 2000;22:435-8.
17. Croft P, Coggon D, Cruddas M, et al. Osteoarthritis of the hip: an occupational disease in farmers. *BMJ* 1992;304:1269-72.

Appendix 1. Discharge Abstract Database (CAD) and Same Day Surgery (SDS) database ICD-9-CM procedure extraction criteria		
Selection criteria, based on DAD or SDS data		
Procedure	ICD-9-CM code	Inclusion / Exclusion
Unilateral or bilateral inguinal herniorrhaphy	53.00 through 53.17	In the primary procedure code field
Appendectomy	47.01, 47.09	In the primary procedure code field
Carpal tunnel release	04.43	In the primary procedure code field
Cholecystectomy	51.22, 51.23	In the primary procedure code field
Thyroidectomy	06.2, 06.31, 06.39, 06.4	In the primary procedure code field
Rectal cancer surgery	48.62, 48.63, 48.5	In the primary procedure code field <b>and</b> that have an ICD-9-CM code of 154.0 or 154.1 in <b>any one</b> of 16 diagnostic code fields
Closed hip fracture repair	820.00, 820.01, 820.02, 820.03, 820.09, 820.20, 820.21, 820.22, 820.8	In the <b>first</b> diagnosis field. <b>Exclude</b> any cases in which a 78.55, 79.25 or 79.35 is <b>not</b> found in the first procedure code field of that record.
Joint replacement*	81.51, 81.52, 81.54	In the primary procedure code field
ICD-9-CM = Clinical modification of the <i>International Classification of Diseases</i> , 9th rev. *Primary hip and knee replacement.		

Appendix 2. Definition of the Rural (RA, RB and RC) surgical service levels	
Rural surgical service level	Definition
Rural A	Those who reside in a polygon in which surgical services are provided by at least one resident certified general surgeon (FRCS) who is living in the community with his/her principal practice at the local hospital. Rural A surgical programs offer all of the procedures of interest with the exception of primary hip and knee replacement and closed reduction of a hip fracture. They also have x-ray, fluoroscopy, ultrasound and endoscopy capability.
Rural B	Those who reside in a polygon in which surgical services are provided by at least one local GP-surgeon or one itinerant (resides outside the hospital catchment area) certified general surgeon (FRCS) and one or more GP-surgeons. Rural B surgical programs do not offer surgical services that are usually restricted to specialist general surgeons, i.e., primary hip and knee replacement, closed reduction of a hip fracture, rectal cancer surgery, cholecystectomy or thyroidectomy. They have x-ray, fluoroscopy, endoscopy, ultrasound and minimal endoscopy capability.
Rural C	Those who reside in a polygon in which no surgical services are provided — there is no resident or itinerant provider with both privileges and procedures that include either cesarean section or appendectomy. In terms of diagnostic capability Rural C facilities usually only have x-ray.



## ORIGINAL ARTICLE ARTICLE ORIGINAL

# Rural surgical services in two Canadian provinces

*Stuart Iglesias, MD*

*Rural Family Physician,  
Gibsons, BC*

*Joshua Tepper, MD*

*Institute for Clinical  
Evaluative Sciences,  
Toronto, Ont.*

*Erik Elleboj, PhD*

*Research and Evidence  
Branch, Alberta Health  
and Wellness*

*Brendan Barrett, MB*

*Professor of Medicine,  
Memorial University  
of Newfoundland,  
St. John's, Nfld.*

*Peter Hutten-Czapski,  
MD*

*Assistant Professor,  
Northern Ontario School  
of Medicine*

*Kir Luong, BSc*

*Research and Evidence  
Branch, Alberta Health  
and Wellness*

*William Pollett, MD*

*Professor and Chair  
of the Discipline of Surgery,  
Memorial University  
of Newfoundland, St. John's,  
Nfld.*

*Correspondence to:  
Dr. Stuart Iglesias, PO Box  
1655, Gibsons BC V0N 1V0*

*This article has been peer  
reviewed.*

*See also Editorial page 185,  
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.

---

## 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.<sup>1</sup> 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).<sup>2</sup>

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<sup>2</sup>, with a population of slightly less than 400 000 residing outside its cities. Alberta covers approximately 662 000 km<sup>2</sup>, with approximately 500 000 residing outside of its cities.

Studies for Western Canada describe the delivery systems for RSPs.<sup>3,4</sup> 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.<sup>5</sup>

### *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.<sup>6</sup>

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

#### **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 catchment areas is described in the paper by Ellehoj and coworkers.<sup>7</sup>

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.<sup>2</sup> 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.<sup>4</sup> These non-special-

ist 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<sup>14</sup> 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

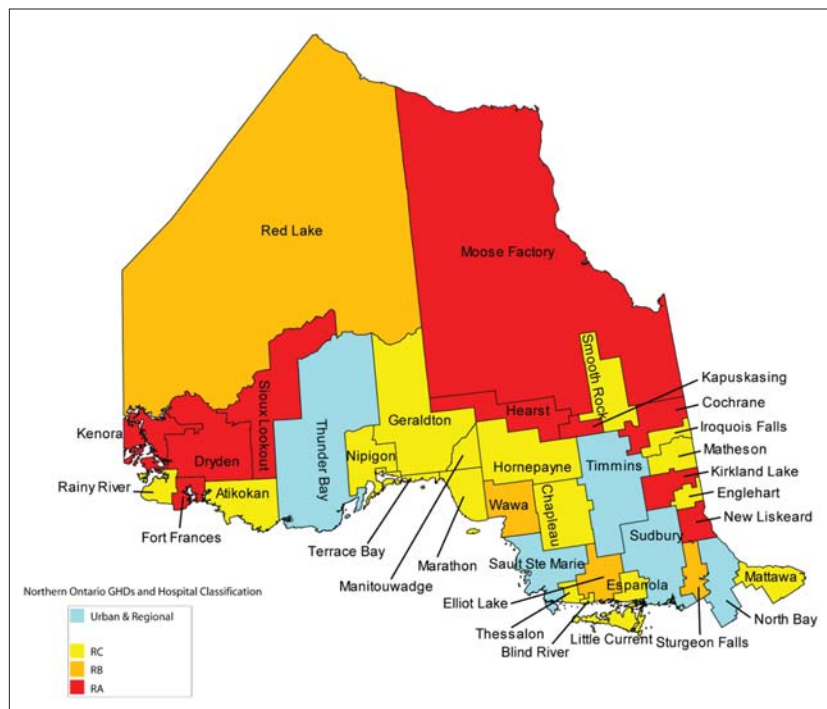


Fig. 1. Rural surgical programs, Northern Ontario, by level of service. RC = Rural C, RB = Rural B, RA = Rural A. GHD = General Hospital Districts. See “Level of Surgical Services” in text for descriptions.



into approximately 6 and 4 procedures per year, respectively. Our data do not allow us to measure the volumes of the Canadian-certified general sur-

geons working in rural Alberta. An earlier study found that rural general surgeons averaged 15 appendectomies per year.<sup>6</sup>

### 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 traveling 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.

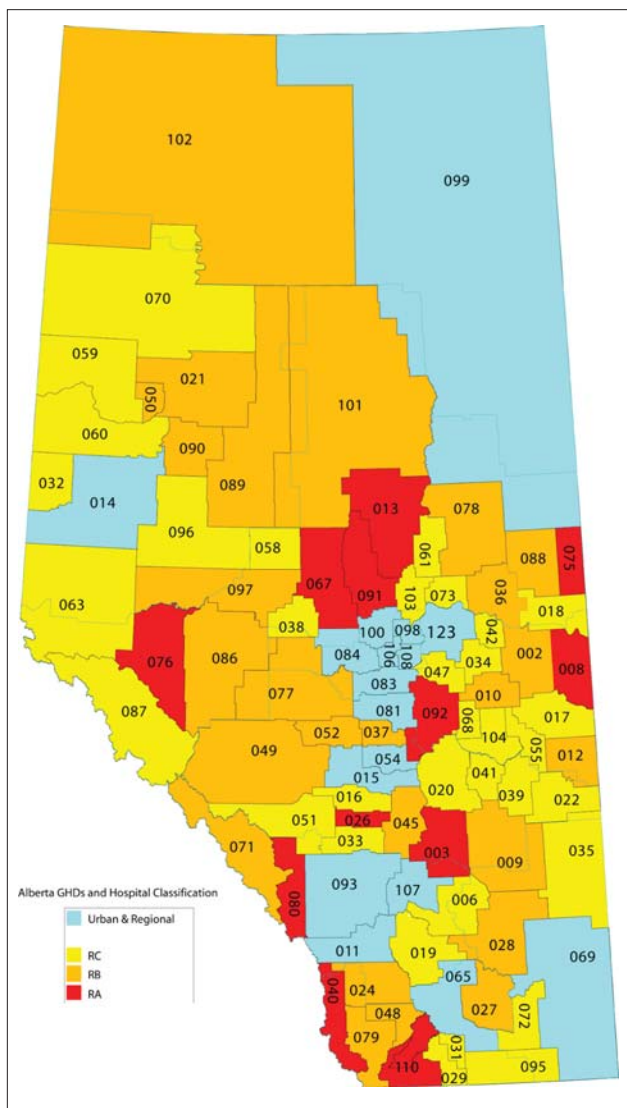


Fig. 2. Rural surgical programs, Alberta, by level of service. GHD = General Hospital Districts. RC = Rural C, RB = Rural B, RA = Rural A. See text for descriptions of categories. See Appendix 1 for definition of each number.

Variable	Rural A*		Rural B†		Rural C‡	
	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**

Travel distance (travel time)	No. of facilities in each services category			
	Rural A to Regional or Metropolitan		Rural B to Rural A	
	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**

Surgical procedure	Type of physician provider, no. of procedures performed (and %) <sup>†</sup>			
	Canadian-certified general surgeons <i>n</i> = 145	Foreign-trained general surgeons <i>n</i> = 16	Family practice surgeons <i>n</i> = 43	Other <sup>‡</sup>
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.  
<sup>†</sup>Percentages have been rounded.  
<sup>‡</sup>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**

Surgical procedure	Type of facility,* volume of procedures					
	Rural A		Rural B		Regional	
	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**

Surgical procedure	No. of physicians (mean no. of procedures per physician)			
	Canadian-certified general surgeons	Foreign-trained general surgeons	Family practice surgeons	Other <sup>‡</sup>
Appendectomy	145 (90)	16 (31)	43 (21)	6 (125)
Carpal tunnel release	53 (50)	12 (58)	38 (34)	105 (37) <sup>‡</sup>
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.  
<sup>‡</sup>Represents physicians with a specialty designation other than general surgery.  
<sup>‡</sup>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.<sup>8,9</sup> 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.<sup>10</sup>

Although the number of procedures per facility and per surgical provider are small — particularly for the Rural B facilities, there is no compelling evi-

dence 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,<sup>11,12</sup> 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.<sup>12</sup> 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.

Surgical procedure	No. (and %) of procedures			
	Rural A		Rural B	
	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.

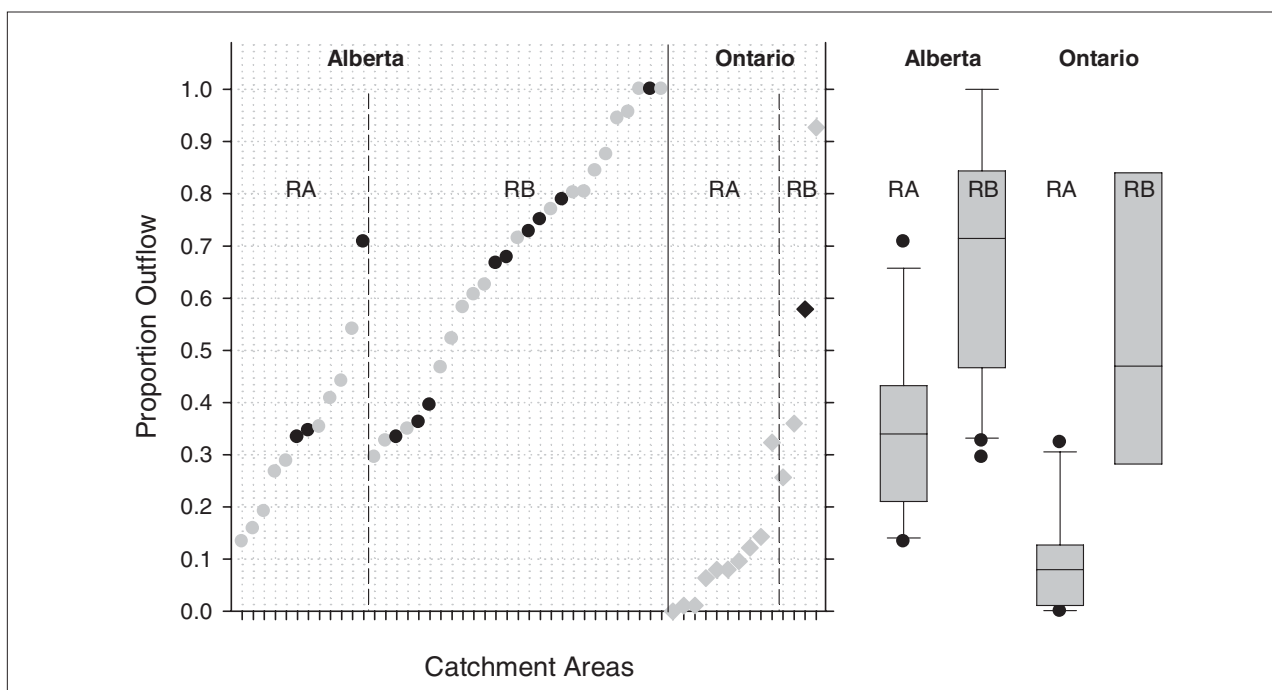


Fig. 3. Appendectomy. Outflow to higher level of care. Box plots represent medians, 25% and 75% ranges, and outliers. Black represents rural surgical programs within 1 hour of a higher level of care. Grey represents more isolated programs. RA = Rural A, RB = Rural B. See text for description. "Ontario" 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<sup>5-23</sup> cases.<sup>13</sup>

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.<sup>14</sup> Certainly one can argue that a centre that performs  $\leq 10$  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 hernior-

rhaphy 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.<sup>9</sup> 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.<sup>15,16</sup> Recently, a large population study from Germany suggests that low-volume obstetric centres have significantly higher perinatal mortality than the high-volume centres.<sup>17</sup> 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.<sup>18</sup> 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.<sup>16,18</sup>

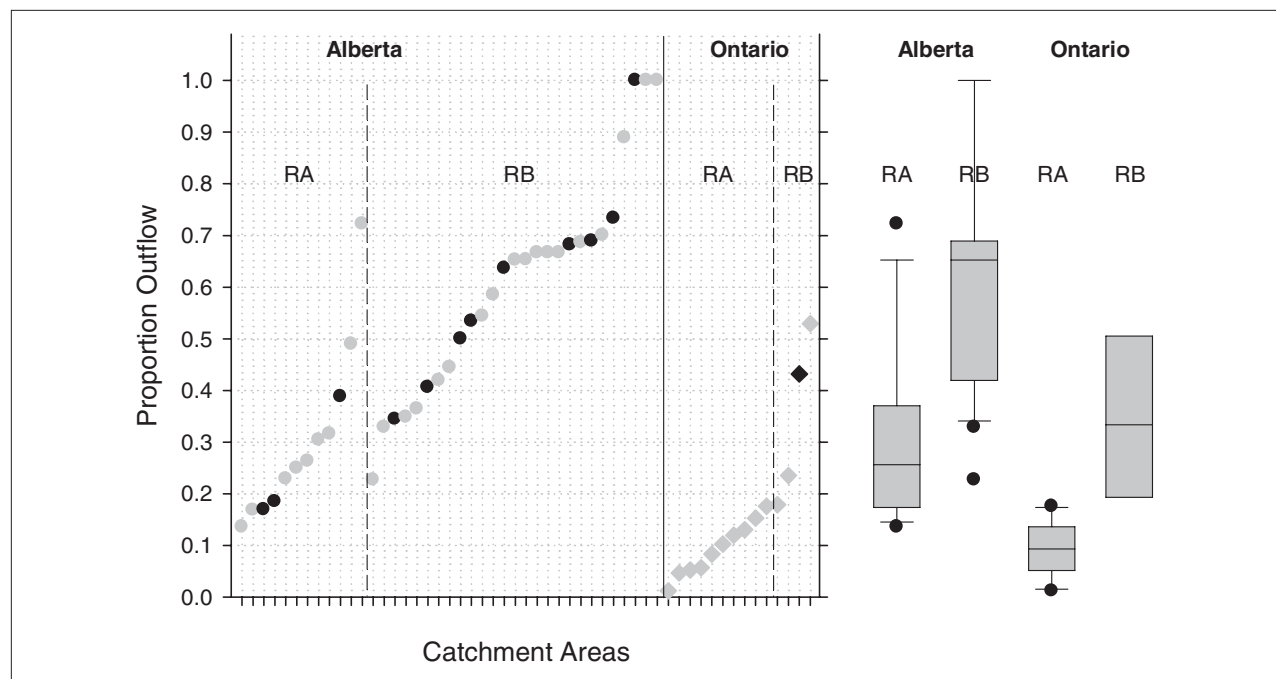


Fig. 4. Herniorrhaphy: Outflow to higher level of care. Boxplots represent medians, 25% and 50% ranges, and outliers. Black represents rural surgical programs (RSPs) within 1 hour of a larger surgical program. Grey represents more isolated RSPs. RA = Rural A, RB = Rural B. See text for description. "Ontario" 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.<sup>19-21</sup> General surgery is a career that is increasingly viewed as non-desirable by graduating students.<sup>22</sup> 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.<sup>23</sup>

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.

**Acknowledgements:** We acknowledge Corrine Truman and Dr. Keith MacLellan, both of whose contributions were invaluable. We acknowledge the significant contributions of Deanna Rothwell and Ping Li, Institute of Clinical Evaluative Sciences, and Kir Luong and Sylvia A. Wilson, Alberta Health and Wellness (AHW). And we acknowledge the valuable contributions made by Ms. Jill Strachan from the Canadian Institute for Health Information. We gratefully acknowledge the support provided by AHW and thank Health Canada for its financial support.

In compiling this article, the researcher has relied upon data supplied, in whole or in part, by AHW. AHW does not review or control the content or accuracy of this article or its findings, nor does AHW warrant the accuracy or completeness of this article or its findings. AHW assumes no legal liability, whether direct or indirect, for the information in this article.

**Competing interests:** None declared.

## REFERENCES

1. Romanow RJ. *Building on values: the future of health care in Canada – final report* [chapter 7]. Saskatoon: Commission on the Future of Health Care in Canada; 2002.
2. Kornelsen J, Grzybowski S, Iglesias S. Is rural maternity care sustainable without general practitioner surgeons? *Can J Rural Med* 2006;11(3):218-20.
3. Chiasson PM, Roy PD. Role of the general practitioner in the delivery of surgical and anesthesia services in rural Western Canada. *CMAJ* 1995;153:1447-52.
4. Iglesias S, Jones LC. Rural surgical programs in Western Canada. *Can J Rural Med* 2002;7(2):103-7.
5. Tepper J, Pollett W, Yan J, et al. Utilization rates for surgical procedures in rural and urban Canada. *Can J Rural Med* 2006;11(3):195-203.
6. Iglesias S, Strachan J, Ko G, et al. Advanced skills by Canada's rural physicians. *Can J Rural Med* 1999;4:227-31.
7. Ellehoj E, Tepper J, Barrett B, et al. Research methodology for the investigation of rural surgical services. *Can J Rural Med* 2006;11(3):187-94.
8. Larimore WL, Davis A. Relationship of infant mortality to availability of care in rural Florida. *J Am Board Fam Pract* 1995;8:392-9.
9. Nesbitt TS, Connell FA, Hart LG, et al. Access to obstetric care in rural areas: effect on birth outcomes. *Am J Public Health* 1990;80:814-8.
10. Foot DK, Stoffman D. *Boom, bust, & echo: How to profit from the coming demographic shift*. Toronto: Macfarlane Walter and Ross; 1997.
11. Caron NR, Lewis-Watts DA, Webber EM. The provision of emergency medical services in isolated communities. *JCC* 1998;41(suppl):8.
12. Iglesias S, Saunders LD, Tracy S, et al. Appendectomies in rural hospitals: safe whether performed by specialist or GP surgeons. *Can Fam Physician* 2003;59:328-33.
13. Deutchman M, Connor P, Gobbo R, et al. Outcomes of cesarean sections performed by family physicians and the training they received: a 15 year retrospective study. *J Am Board Fam Pract* 1995;8:81-90.
14. Williamson HA Jr, Hart LG, Pirani MJ. Rural hospital inpatient surgical volume: cutting edge service or operating on the margin? *J Rural Health* 1994;10(1):16-25.
15. Iglesias S, Hutten-Czapski P. Joint position paper on training for rural family practitioners in advanced maternity skills and cesarean section. *Can J Rural Med* 1999;4(4):209-16. Also available in *Can Fam Physician* 1999;45:2416-22, 2426-32 and *J Soc Obstet Gynaecol Can* 1999;Sept (80).
16. Joint position paper on training for rural family physicians in anesthesia. *Can J Rural Med* 2001;6(4):Suppl. Available: [www.cfpc.ca/English/cfpc/programs/rural family/joint position paper on anesthesia/](http://www.cfpc.ca/English/cfpc/programs/rural%20family/joint%20position%20paper%20on%20anesthesia/) (accessed 2006 June 22).
17. Heller G, Richardson DK, Schnell R, et al. Are we regionalized enough? Early neonatal deaths in low-risk births by the size of delivery units in Hesse, Germany, 1990–99. *Int J Epidemiol* 2002;31:1061-8.
18. Canadian Institute for Health Information. *Health care in Canada, 2005*. Ottawa: The Institute. Available: [http://secure.cihi.ca/cihi-web/products/hcic2005\\_e.pdf](http://secure.cihi.ca/cihi-web/products/hcic2005_e.pdf) (accessed 2006 June 22).
19. Royal College of Physicians and Surgeons of Canada. *Specialty physician workforce study*. Ottawa: The College. 1995.
20. Institute for Clinical Evaluative Sciences. *Supply of physicians' services in Ontario*. Toronto: The Institute; 2003. Available: [www.ices.on.ca/webpage.cfm?site\\_id=1&org\\_id=31&morg\\_id=0&gsec\\_id=0&ritem\\_id=1424](http://www.ices.on.ca/webpage.cfm?site_id=1&org_id=31&morg_id=0&gsec_id=0&ritem_id=1424) (accessed 2006 May).
21. Pollett WG, Harris KA; for the Canadian Association of Surgical Chairs. The future of rural surgical care in Canada: a time for action. *Can J Surg* 2002;45:88-90.
22. Marschall JG, Karimuddin AA. Decline in popularity of general surgery as a career choice in North America: review of postgraduate residency training selection in Canada, 1996–2001. *World J Surg* 2003;27:249-52.
23. Canadian Association of General Surgeons (CAGS). Guidelines for added skills for family physicians [position paper]. Available: [www.cags-accg.ca](http://www.cags-accg.ca) (accessed May 06).

<b>Appendix 1. Facility classifications for Alberta and Northern Ontario</b>			
Province, classification, map number*	Location	Population	Distance to next highest level of care, km
<b>Alberta, Rural A</b>			
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
<b>Alberta, Rural B</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
<b>Northern Ontario, Rural A</b>			
	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
<b>Northern Ontario, Rural B</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.



## PODIUM: DOCTORS SPEAK OUT LA PAROLE AUX MÉDECINS

### Is rural maternity care sustainable without general practitioner surgeons?

*Jude Kornelsen, PhD*

*Department of Family Practice, University of British Columbia, Vancouver, BC*

*Stefan Grzybowski, MD, MCISc, FCFP*

*Department of Family Practice, University of British Columbia, Vancouver, BC*

*Stuart Iglesias, MD*

*Rural Family Physician, Gibsons, BC*

*Correspondence to: Dr. Jude Kornelsen, Assistant Professor, Department of Family Practice, University of British Columbia Centre for Rural Health Research, VCHRI 550-1501 W Broadway, Vancouver BC V5H 2V5*

Rural maternity services are undergoing rapid erosion across Canada's more sparsely settled regions.<sup>1-5</sup> In rural British Columbia, 17 maternity care services have closed since 2000,<sup>5</sup> mirroring trends in other regions. The consequences of these closures are not fully understood, but studies in rural Canada and the United States have shown that women from areas that provide some level of local maternity care services have better birth outcomes than women without access to any local services, and qualitative research suggests significant psychosocial costs to rural BC women who do not have access to local services.<sup>4-8</sup>

Recent studies in BC and Alberta,<sup>9,10</sup> and unpublished data by one of the authors (S.G.) and others, have found that maternity services without local cesarean section capability are particularly vulnerable to closure (Grzybowski S, et al, Dept. of Family Practice, University of British Columbia [UBC]: unpublished data, 2003-04). The challenge in rural communities is how to provide surgical services in the face of low volume and the absence of specialist care. An emerging solution, primarily in Western Canada, has been to rely on non-certified surgeons who have trained outside of Canada and Canadian general practice graduates with enhanced training and skills for surgical maternity services. In BC, GP surgeons currently provide care in 19 rural communities (Humber N, Frecker T, Dept. of Family Practice, UBC: unpublished data, 2005), and in Alberta in 2002, cesarean section services were provided by non-certified surgeons in

46 rural communities for 20% of all births.<sup>11</sup>

Cesarean section capability has been shown to underpin the sustainability of maternity services and is one of the key factors considered in deliberations over the maintenance or discontinuance of local rural maternity care services.<sup>5</sup> A study comparing birth outcomes from 2 small rural communities in BC with similar populations showed, not surprisingly, that the community with cesarean section capability, even though intermittent, supported a higher percentage of local deliveries than the community without cesarean section capability. In 1986, the communities with and without cesarean section capability were able to respectively help 78% and 55% of local women to give birth; in 2000 these proportions had fallen to 61% and 35%.<sup>10</sup> Indeed, the service that was only doing 35% of local deliveries in 2000 closed their maternity service entirely that same year.

A larger pilot study that stratified rural BC hospital services demonstrated that when GP surgeons provided local cesarean section services continuously, 85% of local women gave birth in their home communities. This compared favourably to larger rural communities served by obstetricians and/or general surgeons providing cesarean section support in which 91% of women were able to give birth in their local community (Grzybowski S, et al, Dept. of Family Practice, UBC: unpublished data, 2001.) Smaller communities served by maternity services without local access to cesarean section delivered less than 30% of the parturient population locally (Grzybowski S,



---

et al, Dept. of Family Practice, UBC: unpublished data, 2001). These results parallel those from Iglesias and coworkers' work in Alberta, which documented rates of 80% local birth in GP surgery communities and 24% local birth where local cesarean section was not available.<sup>11</sup>

The sustainability considerations described above led the delegates of the 2000 Consensus Conference on Obstetrical Services in Rural or Remote Communities, in BC, to state:<sup>5</sup>

C/S capability should be maintained where it exists and consideration given to *adding* [emphasis ours] this capability where appropriate and feasible within the context of a regional maternity service. The existence of local C/S capability can allow more women to receive appropriate care in or near their community and obviate some of the negative social effects of elective transfer.

Similarly, a 1998 Joint Position Paper released by the Society of Obstetricians and Gynaecologists of Canada, the Society of Rural Physicians of Canada and the College of Family Physicians of Canada states:<sup>12</sup>

It would be essential for communities that presently have cesarean section capability to maintain this service until such evidence [concerning the safety of services without cesarean section capability] is available.

Based on existing evidence, it appears that the role of GP surgeons in supporting sustainable maternity services in rural communities is pivotal.<sup>9-12</sup> Evidence on the safety of maternity services in the absence of surgical back-up is scant, and emerging data from pilot projects of isolated services in Canada's northern regions suggest excellent outcomes in midwifery-led non-surgical services.<sup>15</sup> However, the sustainability of most non-surgical physician-led services is in question from a health human resource perspective. This is due primarily to stress on physicians of the possibility of a bad outcome.<sup>14</sup> In a recent study on rural care providers' experiences of maternity care in BC (Grzybowski S, Kornelsen J, Dept. of Family Practice, UBC, and Cooper E, Oxford University: unpublished data, 2005) rural physicians in Level I communities without surgical back-up expressed consensus around the tenuousness of their practice. They acknowledged that not only were they not sustainable but also that the possibility of replacing them with someone willing to provide maternity care was small. In Level 0 communities (no maternity care), physicians reported stopping (or never engaging in) maternity care due to their discomfort

in practising without surgical back-up and concerns that in the event of a bad outcome the decision to have provided services would be called into question from a legal perspective. In addition to the current medicolegal context, the current 22.1% rate<sup>15</sup> for operative deliveries Canada-wide leads many to feel that surgical capability is a core requirement for maternity services. If this is the case, such care in smaller rural communities without the population base to support specialist care will be in jeopardy if we do not look to alternative models.

Internationally, policy-makers have committed to models of care for rural parturient women that rely heavily on the services of GP surgeons.<sup>16,17</sup> In the United States, a 2003 position paper recommended that family physicians be supported in providing cesarean sections, particularly in rural areas where they may be the sole or major providers of perinatal care.<sup>16</sup> As well, "procedural general practitioners" have been the focus of several research and policy initiatives in Australia over the past 5 years.<sup>18</sup>

This raises the question of why Canada has not more actively explicated a health services approach to GP surgeons encompassing training, certification and quality assurance, as has already occurred for GP anesthesia and advanced maternity skills.<sup>19,20</sup> Currently, the challenges to accessing local training are significant and are underpinned by a lack of recognition of the role GP surgeons play in sustainable rural health. The challenges are made evident through difficulties in securing mentorship and the lack of an organized, standardized, evidence-based approach to training.

A small percentage of Canadian GP surgeons restrict their scope of practice to cesarean section, usually in communities where other surgical services are provided by a specialist surgeon. Although this model may be sustainable, it is doubtful that small communities that limit surgical procedures entirely to cesarean sections will be able to maintain the human, financial and technical resources required of an operating room. It appears that extending surgical scope to include appendectomies, surgery for complications arising from ectopic pregnancies, and other emergency and elective procedures may be an efficacious way to increase operating room volume and rationalize infrastructural resource issues.

Emerging evidence and experience suggests that GP surgeons are an important, if not critical, human resource underpinning the maintenance of sustain-

able maternity and surgical services in many rural Canadian communities. It is difficult, however, to reconcile this with a health policy and evidence framework that does not acknowledge their importance. Perhaps the Society of Rural Physicians of Canada and the Canadian Association of General Surgeons can provide the coordinated leadership to support the consolidation of this important service for rural communities.

**Competing interests:** None declared.

## REFERENCES

1. Allen VM, Jilwah N, Joseph KS, et al. The influence of hospital closures in Nova Scotia on perinatal outcomes. *J Obstet Gynaecol Can* 2004;26:1077-85.
2. Rourke JTB. Trends in small hospital obstetrical services in Ontario. *Can Fam Physician* 1998;44:2117-24.
3. British Columbia Reproductive Care Program. *Report on the findings of a consensus conference on obstetrical services in rural or remote communities: consensus symposium summary*. Vancouver (BC): BCRCP. 2000.
4. Larimore W, Davis A. Relationship of infant mortality to availability of care in rural Florida. *J Am Board Fam Pract* 1995;8:392-9.
5. Nesbitt T, Connell F, Hart G, et al. Access to obstetric care in rural areas: effect on birth outcomes. *Am J Public Health* 1990;80:814-8.
6. Nesbitt TS, Larson EH, Rosenblatt RA, et al. Access to maternity care in rural Washington: its effect on neonatal outcomes and resource use. *Am J Public Health* 1997;87:85-90.
7. Kornelsen J, Gryzbowski S. Safety and community: the maternity care needs of rural parturient women. *J Obstet Gynaecol* 2005;27:247-53.
8. Kornelsen J, Gryzbowski S. The costs of separation: the birth experience of women in isolated and remote communities in British Columbia. *Can Woman Studies J* 2005;24:75-80.
9. Iglesias S, Tepper J, Ellehoj E, et al. Rural surgical services in two Canadian provinces. *Can J Rural Med* 2006;11(3):207-17.
10. Lynch N, Thommasen H, Anderson N, et al. Does having cesarean section capability make a difference to a small rural maternity service? *Can Fam Physician* 2005;51:1238-9.
11. Iglesias S, Bott N, Ellehoj E, et al. Outcomes of maternity care services in Alberta, 1999 and 2000: a population-based analysis. *J Obstet Gynaecol Can* 2005;27:855-63.
12. Iglesias S, Grzybowski SCW, Klein MC, et al. Rural obstetrics. Joint position paper on rural maternity care. *Can J Rural Med* 1998;3(2):75-80. Also available in *Can Fam Physician* 1998;44:831-6 and *J Soc Obstet Gynaecol Can* 1998;20(4):393-8.
13. National Aboriginal Health Organization. *Exploring models for quality maternity care in First Nations and Inuit communities: a preliminary needs assessment*. Ottawa: The Organization; 2006.
14. Kornelsen J, Grzybowski S. *Women's experiences of maternity care: implications for policy and practice*. Ottawa: Status of Women Canada. 2004.
15. Liu S, Rusen ID, Joseph KS, et al. Recent trends in caesarean delivery rates and indications for caesarean delivery in Canada. *J Obstet Gynaecol Can* 2004;26:735-42.
16. Deutchman M. *Cesarean delivery in family medicine* [position paper]. American Academy of Family Physicians, Policy and Advocacy [Internet serial]. 2003. Available: [www.aafp.org/x25030.xml](http://www.aafp.org/x25030.xml) (accessed 2006 June 26).
17. Dunbabin J. *Procedural medicine in rural and remote NSW: the general practice workforce*. Australia: NSW Rural Doctors Network; 2002.
18. Stratigos S, Nicols A. *Procedural rural medicine: Strategies towards solutions*. Australia: Rural Doctors Association of Australia/Australian College of Rural and Remote Medicine; 2002.
19. Iglesias S, Hutten-Czapski P. Joint position paper on training for rural family practitioners in advanced maternity skills and caesarean section. *Can J Rural Med* 1999;4:209-16.
20. Working Group of the Society of Rural Physicians of Canada, College of Family Physicians of Canada, and Canadian Anesthesiologists Society. Joint position paper on training for rural family physicians in anesthesia. *Canadian Journal of Rural Medicine*. 2001; 6(4):Supplement.

## Congratulations!

Congratulations to the winners of the **Rural Resident Essay Contest:**

Gavin Parker, Alberta Rural Family Medicine North  
Syed Qadry, Memorial University of Newfoundland

Congratulations also to the winner of the **Medical Student Essay Contest:**

Jonathan Kerr, 4th-year medical student, University of Toronto



## West Coast tale

David Arnold, MD

Bella Bella Medical Clinic,  
Waglisla, BC

Correspondence to:  
Dr. David Arnold,  
Bella Bella Medical Clinic,  
Waglisla BC V0T 1Z0

Until 1999, Bella Bella (Waglisla) provided the only surgical services on BC's Inside Passage between Vancouver Island and Prince Rupert. The population, comprising the fishing fleet, logging, boaters, tourists and several First Nations communities, relied on these services for maternity care, simple elective surgical and dental procedures and, most importantly, surgical emergencies such as appendicitis, trauma and cesarean section. The decision to withdraw surgical services, made for reasons of expense and staffing, has left these remote populations with significantly diminished access to essential health care. Maternity care continued after 1999 until it too was withdrawn in 2001, for reasons largely related to the loss of cesarean section capability. — Editor.

It was a dark and stormy night." Really. We were crammed into the stifling hold of the motor vessel *Cape Farewell*, which was carefully making its way to Bella Coola, dodging logs and riding up and down the curves of the wind-whipped waves. It may have been cool and rainy outside but it was hot and steamy in the sealed unit that was the patient transport bay. Normally, there are 2 people in the bay — the patient and the attendant. On this night, there were 5 of us, barely finding room to ride out the 3½-hour journey from Bella Bella to Bella Coola.

Only Jenny could lie down and she needed to because, with a systolic pressure of 70, sitting up was out of the question. When she did raise herself from the gurney it was to relieve her intense seasickness into a bucket. The nurse accompanying us faithfully tended the remaining delicate and oh so precious IV line, through which blood dripped slowly but steadily. Myself and another physician sat waiting patiently for the arrest that we desperately hoped would not happen. Jenny's husband, Henry, seemed shell-shocked as he fondly held Jenny's pale, cool hand. Conversation was doomed by the steady 150 dB drum-

ming of the vessel's diesels and the hearing protection that was needed to keep it to a dull roar.

How was it that we came to be in this deafening Dante-esque inferno hoping to make landfall in Bella Coola next morning at 1:00 am?

The pain came suddenly while she was jogging. Jenny had gained a fair bit of weight during her recent pregnancy, now 4 months passed, and was doing her best to regain her previous form. No amount of stretching or massaging would make the pain in her left side go away, so she elected to come to our small village hospital.

The hospital, R.W. Large Memorial, has been in Bella Bella for about 100 years. Bella Bella is the common, though unofficial, name for the remote First Nations community that has been in this area for several thousand years. It is an island. The Methodists (later the United Church) started a mission hospital, bringing medical care to people who had no other access to western-style medicine and surgery. In the early years, surgery was dominant, given the very limited potency of the then available medicines. Of course, things have changed: we now have potent medicines, and surgery is not practised here, as is the case in many rural and

---

remote hospitals. Unfortunately, Jenny would need surgery.

Jenny was assessed by our family medicine resident about 4:30 in the afternoon. Her vital signs were all normal, but she was tender in her LLQ. She had no worrisome bleeding or evidence of peritonitis. Pelvic exam was difficult because of Jenny's size, but she was tender there as well. The usual differential diagnoses were reviewed with the resident. To Jenny's surprise, and our dismay, tests showed that she was pregnant again.

The sun passed below the horizon unnoticed at 5:30, hidden by the dark clouds that brought the driving rain. In Bella Bella, I have learned to always look heavenward when I realize that I have, or may soon have, a seriously ill patient in my care. Divine guidance is always welcome, of course, but I am actually checking the skies for bad weather and for light. On this day, with Jenny pregnant and in pain, we had lots of the former and none of the latter.

The local airstrip has neither radar nor lights, so a foul weather or nighttime medevac was out of the question. Jenny's pain had settled with a little Toradol, and she was fairly comfortable as I went over the possibilities with her. "Yes, you're pregnant but there were other possibilities, unrelated to pregnancy, for your pain. Your pulse, blood pressure, respirations and temperature are all completely normal, as are your blood tests." The plan was to keep her in hospital overnight then send her out for an ultrasound in the morning. Just as a precaution, I would recheck her CBC in a couple of hours and have an IV started. There was no point ordering a cross-match because her blood could not get out for cross-matching until the morning, when Jenny would be hopefully finding out more about her belly pain. R.W. Large Memorial is one of only a few remaining hospitals that has only a single RN on duty to cover the acute in-patients, long-term care patients and the ED. Knowing that the RN's attention would be distracted by the many other claims on her, I advised Jenny that despite how well she felt at present, she was to call the nurse if she felt even the slightest bit dizzy.

Jenny fainted at 6:20 pm, just after a visit to the bathroom. I was at home, enjoying dinner when the call came.

"She's crashed!"

I considered asking who "she" was and what "crashed" meant, but I knew. The hospital is just 75 metres from my door, so I was there not long after the nurse hung up the phone. Jenny was lying on the ED stretcher with a cool cloth on her forehead.

Her blood pressure was too low for our automated machines to pick up but could be felt at 65 systolic. Her examination was otherwise unchanged, including her hemoglobin, but it was clear enough that a ruptured ectopic pregnancy was the only diagnosis worth considering.

A second IV, fluids and catheter were ordered, along with all of the unmatched O-negative blood that we had in stock — 6 units in total. Help arrived in the form of off-duty doctors and nurses — 2 of each. A second IV site was found, then lost. Three attempts at a central line were defeated by a combination of our collective inexperience, Jenny's size and her perilously low blood pressure. Urine output was negligible. After consulting with the gynecologist on call at St. Paul's Hospital in Vancouver, a plan was hatched to get Jenny out ASAP.

**R.W. LARGE MEMORIAL IS ONE OF ONLY A FEW REMAINING HOSPITALS THAT HAS ONLY A SINGLE RN ON DUTY TO COVER THE ACUTE IN-PATIENTS, LONG-TERM CARE PATIENTS AND THE EMERGENCY DEPARTMENT.**

When we have a critically ill patient and no air medevac is possible, we have come to rely on the Coast Guard as back-up. We have been privileged many times to have our patients rescued by the Air-Sea rescue helicopter based in Comox. Their chopper has its own landing lights and comes equipped with a top-flight rescue crew. This night, the dispatcher regretfully informed me that the helicopter and crew were about their proper business, conducting an Air-Sea rescue. Our only available option was a boat that could traverse the open ocean around (rightfully named) Cape Caution and get us to Port Hardy (where they have lights and radar) for an air medevac to Vancouver. The ship was a few hours away from Bella Bella but could be there by 10:00 pm and in Port Hardy by 6:00 am the next morning. With an aircraft waiting in Port Hardy and calculating ambulance transfer times in as well, Jenny could be at the gates of St. Paul's by 9:00 am.

I thought of the other gates, where St. Peter does the greeting. So did the young and sympathetic St. Paul's gynecologist who, when she head of the pro-

---

posed ETA, gave voice to the sentiment that had wordlessly enveloped the hospital staff and Jenny's family crowded around the nursing desk — "My God, she's going to die!"

Sometimes we are good and sometimes we are lucky. I fortunately remembered another option, one I had never used or even considered before. Our sister hospital in Bella Coola, despite its being the same size as ours, has kept a C-section program going over the years even as surgical services have otherwise dwindled. Its 3 doctors can get a cesarean done. I wondered if they could do an ectopic. I called. They would give it a try. Bella Coola is 60 nautical miles away and, like Bella Bella, lacks lights and radar for medevacs. If I could get a boat to take us to Bella Coola, Jenny would have a chance. Fortunately, the Coast Guard had a 30-foot "ambulance" vessel, and I could see its lights no more than 750 m from us across the channel.

It was now 9:00 pm and, as the community rallied 8 very strong men to hoist Jenny's stretcher down to the waiting *Cape Farewell*, nature had one last obstacle to place in our way. The tide had gone out, way out, to nearly the lowest tide of the year. I stood at the bottom of the near 45° wooden ramp, slicked with rain, like a demented choreographer and called out steps to the 8 litter bearers, hoping

that Jenny, her stretcher and the 8 would not end up in a heap at the bottom.

They didn't, and soon enough we were away. We had brought blood, saline, IV equipment and gear for resuscitation and lots of hope and prayers. We arrived in Bella Coola about 1:00 am, and nature granted us a bit of a reprieve by allowing the tide to rise and the rain and wind to slacken. We were greeted at the hospital by our 3 OR-garbed colleagues who took over Jenny's care while a thoughtful nurse fed we reluctant mariners tea and cookies before our return journey to Bella Bella.

Jenny had 2½ L of blood in her belly and a messy-looking left adnexa, but the Bella Coola physicians did a marvellous job of patching her up and returning her to her normal life of woman, wife and mother.

Such is life on the remote Central Coast.

But should it be so? Had Jenny died, what deficiencies would have been noted and corrected so that the next case would have an acceptable outcome? Ten years ago, a GP surgeon in Bella Bella would have treated her. Advances in medicine have done much, but the drive to specialize and centralize has left Bella Bella out of sight, out of mind and far too dependent on Lady Luck. Especially on dark and stormy nights.

## **RURALMED: THE SRPC LISTSERV**

## **MEDRURALE : LE SERVEUR DE LISTE DE LA SMRC**

### **RURALMED**

Subscription to RuralMed is by request. Send an email message to: [admin@srpc.ca](mailto:admin@srpc.ca)

Include your full name and email address. If you include a short biography it will be posted to the list as your introduction. You can also access both the RuralMed archives and a RuralMed subscription form through the SRPC home page at: [www.srpc.ca](http://www.srpc.ca)

### **MEDRURALE**

Pour vous abonner au serveur de liste francophone, MedRurale, veuillez envoyer un courriel à l'adresse suivante : [lamarche@comnet.ca](mailto:lamarche@comnet.ca)

Donner votre nom au complet et votre adresse de courriel. Si vous ajoutez aussi une courte biographie, elle pourra être affichée sur la liste en guise de présentation. Vous pouvez aussi accéder aux archives de MedRurale et à un formulaire d'inscription au serveur de liste anglophone sur la page d'accueil du site de la SCMR, [www.srpc.ca](http://www.srpc.ca)