Canadian Journal of Rural Medicine

Journal canadien de la médecine rurale

The official journal of the Society of Rural Physicians of Canada

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

VOLUME 20, NO. 1, WINTER 2015

VOLUME 20, Nº 1, HIVER 2015

IN THIS ISSUE / DANS CE NUMÉRO

Choosing Wisely Canada.
A healthy conversation.

When it comes to your health, more medical tests, treatments and procedures are not always better. In fact, sometimes they're unnecessary. Find out when you need medical tests, treatments and procedures — and when you don't.

Talk with your doctor or visit ChoosingWiselyCanada.org

@ChooseWiselyCA

Choosing Wisely Canada

In partnership with the Canadian Medical Association

srpc.ca

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 Dollco Integrated Print Solutions, Ottawa, Ont.

Address all correspondence to: Editor, *CJRM*, 45 Overlea Blvd., P.O. Box 22015, Toronto ON M4H 1N9; 416 961-7775; fax 416 961-8271; cjrm@cjrm.net

CJRM is indexed in *Index Medicus* and MEDLINE.

Publications Mail Agreement no. 4138705. Send address changes to: CMA Member Service Centre, *CJRM*, 1870 Alta Vista Dr., Ottawa ON K1G 6R7; 888 855-2555; cmamsc@cma.ca

ISSN 12037796

Canadian Journal of Rural Medicine
Journal canadien de la médecine rurale

Vol. 20, No. 1, Winter / Hiver 2015

EDITORIALS / ÉDITORIAUX

ORIGINAL ARTICLES / ARTICLES ORIGINAUX

THE PRACTITIONER / LE PRATICIEN

PODIUM: DOCTORS SPEAK OUT
LA PAROLE AUX MÉDECINS

The Village
Watercolor and acrylic, 22" × 30", by Brian Allen Adams
© 2005
www.facebook.com/brianallenadams
GCN Art Gallery, St. Andrews, NB
"The Village *is my way of giving respect for Dr. Wilfred Grenfell and the mission in St. Anthony, NL. Dr. Grenfell practised medicine, built hospitals, established schools and created a world-famous craft hooked rug industry."*

ASSOCIATION MÉDICALE CANADIENNE / CANADIAN MEDICAL ASSOCIATION

CJRM is published for the SRPC by 8872147 Canada Inc., a wholly owned subsidiary of the Canadian Medical Association (CMA), 1867 Alta Vista Dr., Ottawa ON K1G 5W8. The SRPC and the CMA subsidiary 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 its subsidiary.

Director and Publisher
Directrice et éditrice
Glenda Proctor

Associate Director, Publications
Directrice associée, Publications
Holly Bodger

Managing Editor
Directrice de la rédation
Kate Brown
800 663-7336 x2114
kate.brown@cma.ca

Production
Debbie Rupert
Sarah O'Neill, Jennifer Pershick, Clara Walker

Online Publishing
Publication en direct
James Harbinson, James Manship

Career/Classified Advertising
Carrières et annonces classées
Laurie McLeod, Susan Ritchie
advertising@cma.ca

Display Advertising
Annonces publicitaires
David Bertrand
displayadvertising@cma.ca

Marketing and Advertising
Sales Marketing et publicité
Keith Communications Inc.
info@keithhealthcare.com
Oakville: 905 849-7777; 800 661-5004
fax 905 849-1055

Instructions for Authors / Directives aux auteurs

Visit/visitez srpc.ca

Renseignements généraux

Visitez srpc.ca

SRPC and The Rounds

The Society of Rural Physicians of Canada is excited to announce

its official partnership with The Rounds.

The Rounds has been built specifically for physicians in Canada. The platform is free for any practising physician, and the SRPC group (for SRPC members only) has been designed specifically for rural collaboration. The platform will allow us to have more engaging conversations, and for those subscribed to the listserv (RuralMed), it will offer a new and exciting place to engage with familiar peers. Signing into The Rounds will immediately connect you with thousands of physicians and surgeons.

The Rounds platform offers a wide range of member benefits. We encourage you to sign up and join the official SRPC group here: www.therounds.ca

SAVE THE DATE

World Summit on Rural Generalist Medicine
Montréal, Quebec
Apr. 8–9, 2015
(In conjunction with Rural and Remote 2015)
srpc.ca/rr2015

Attacking generalism: using numbers when your argument is weak

Peter Hutten-Czapski, MD
Scientific editor, CJRM
Haileybury, Ont.

Correspondence to:
Peter Hutten-Czapski;
phc@srpc.ca

It has often been said that there are 3 types of lies: lies, damned lies and statistics. The latter is often used to provide the appearance of substance to an argument that would otherwise be laughable. One of those arguments is the health-policy concept that volume is a proxy for quality.

On the face of it, the proposition is simple. You cut out low-volume concerns because of "inherent" difficulties in quality (e.g., Rolls-Royce and rural obstetrics) in favour of high-volume concerns (e.g., General Motors, and medical and surgical specialists). This will "of course" improve outcomes ... well, except for the 30 million cars recalled by GM this year[1] and the thousands of pathology reports found to be inaccurate in New Brunswick.[2]

Indeed, volume is not a predictor of quality. High volumes only guarantee large numbers of affected people when the quality goes south.

In our highly centralized medical system, only some very specialized services (e.g., the Whipple procedure and coronary artery bypass grafting) have been found to have outcomes that are volume-dependent.[3]

Specifically, low-volume obstetrics has been found to be at least as safe as obstetrics practised in big centres.[4,5] Furthermore, just because the outcomes are equivalent when services are provided in both rural and urban locations does not mean you will get the same outcomes if you ship everyone to the larger centre. Distance to services does matter. Grzybowski and others[6] found that, in rural British Columbia, adjusted odds ratios for perinatal mortality in newborns from catchment areas more than 4 hours from services was 3.17 (95% confidence interval 1.45–6.95). This evidence applies to rural obstetrics, which is a well-studied area, but the principles it illustrates apply equally to rural family practice–anesthesia, rural surgery and others.

When faced with evidence of safety at low numbers, and evidence that closure of local services can worsen outcomes, why are we talking about numbers at all? Shouldn't the conversation be about determining and ensuring a correct density of local health services that most effectively provides care for the population?

And when it comes to safe, efficient and effective health care at many levels of care, I suspect Canada may benefit from more rural doctors and more rural hospitals providing more services, and not fewer. Prove me wrong.

REFERENCES

1. Media Online GM. GM 2014 year-to-date North American recalls including exports. 2014-05-28. Available: http://media.gm.com/content/dam/Media/images/US/Release_Images/2014/05-2014/recalls/Recalls-Running-Total.jpg (accessed 2014 Dec. 4).
2. Bissett K; The Canadian Press. Lawsuit over pathology errors in N.B. can proceed as class-action. CTV News Atlantic 2014 Feb. 27. Available: http://atlantic.ctvnews.ca/lawsuit-over-pathology-errors-in-n-b-can-proceed-as-class-action-1.1706347#ixzz3Kx7EjJ4F (accessed 2014 Dec. 5).
3. *Health care in Canada*. Ottawa (ON): Canadian Institute for Health Information; 2005. Available: https://secure.cihi.ca/free_products/hcic2005_e.pdf (accessed 2014 Dec. 4).
4. Black DP, Fyfe IM. The safety of obstetric services in small communities in northern Ontario. *Can Med Assoc J* 1984;130:571-6.
5. Joint Position Paper Working Group. Joint position paper on rural maternity care. *Can J Rural Med* 2012;17:135-41.
6. Grzybowski S, Stoll K, Kornelsen J. Distance matters: a population based study examining access to maternity services for rural women. *BMC Health Serv Res* 2011;11:147.

S'attaquer au généralisme : utiliser les chiffres pour contrer un argument faible

Peter Hutten-Czapski, MD
Rédacteur scientifique, JCRM
Haileybury (Ont.)

Correspondance :
Peter Hutten-Czapski;
phc@srpc.ca

On dit souvent qu'il y a 3 sortes de mensonges : le mensonge, le sale mensonge et les statistiques. Les chiffres servent souvent à donner une apparence de substance à un argument qui serait autrement risible. Le concept émanant des politiques de santé selon lequel le volume peut se substituer à la qualité en est un.

À première vue, la proposition est simple. On exclut les préoccupations liées aux faibles volumes, en raison de difficultés « inhérentes » au niveau de la qualité (p. ex., Rolls-Royce et l'obstétrique en milieu rural), en faveur de celles qui ont trait aux volumes importants (p. ex., General Motors et les spécialistes en médecine et en chirurgie). Cette approche « bien entendu » les résultats ... sauf dans le cas des 30 millions de véhicules rappelés par GM cette année[1] et des milliers de rapports de pathologie jugés inexacts au Nouveau-Brunswick[2].

Effectivement, le volume n'est pas un prédicteur de qualité. Les gros volumes garantissent seulement que de nombreuses personnes seront touchées lorsque la qualité s'effrite.

Dans notre système médical très centralisé, on a constaté que des services très spécialisés (p. ex., l'intervention de Whipple et le pontage aortocoronarien) sont les seuls à produire des résultats liés aux volumes[3].

Plus précisément, on a constaté que l'obstétrique à faible volume est au moins aussi sécuritaire que l'obstétrique pratiquée dans les grands centres[4,5]. De plus, la simple équivalence entre les résultats de services fournis en milieux rural et urbain ne signifie pas que l'on obtiendra les mêmes résultats si l'on envoie tout le monde dans les grands centres. L'éloignement des services importe. Grzybowski et ses collaborateurs[6] ont constaté que dans les régions rurales de la Colombie-Britannique, les coefficients rajustés de probabilité de mortalité périnatale chez les nouveau-nés de régions desservies situées à plus de 4 heures des services s'établissaient à 3,17 (intervalle de confiance à 95 %, 1,45–6,95). Ces données s'appliquent à l'obstétrique en milieu rural, domaine qui a été bien étudié, mais les principes qu'elles illustrent s'appliquent tout autant à la médecine familiale, à l'anesthésie et à la chirurgie en milieu rural, notamment.

Face à des preuves de sécurité lorsque les volumes sont faibles et à des données probantes démontrant que la fermeture de services locaux peut aggraver les résultats, pourquoi parler même de chiffres? Les discussions ne devraient-elles pas porter plutôt sur la façon de déterminer et d'assurer la densité de services de santé locaux qui permettra de fournir de la façon la plus efficace des soins à la population?

Et lorsqu'il est question de la prestation de soins de santé sécuritaires, efficients et efficaces à de nombreux niveaux de soin, je soupçonne qu'il serait bénéfique pour le Canada de compter plus de médecins ruraux et d'hôpitaux ruraux fournissant plus de services et non moins. Qu'on me prouve que j'ai tort.

RÉFÉRENCES

1. Media Online GMGM. 2014 year-to-date North American recalls including exports. Le 28 mai 2014. En ligne : http://media.gm.com/content/dam/Media/images/US/Release_Images/2014/05-2014/recalls/Recalls-Running-Total.jpg (consulté le 4 décembre 2014).
2. Bissett K. The Canadian Press. Lawsuit over pathology errors in N.B. can proceed as class-action. CTV News Atlantic. Le 27 février 2014. En ligne : http://atlantic.ctvnews.ca/lawsuit-over-pathology-errors-in-n-b-can-proceed-as-class-action-1.1706347#ixzz3Kx7EjJ4F (consulté le 5 décembre 2014).
3. *Les soins de santé au Canada.* Ottawa (Ont.) : Institut canadien d'information sur la santé; 2005. En ligne : https://secure.cihi.ca/free_products/hcic2005_f.pdf (consulté le 4 décembre 2014).
4. Black DP, Fyfe IM. The safety of obstetric services in small communities in northern Ontario. *Can Med Assoc J* 1984;130:571-6.
5. Groupe de travail sur la déclaration de principe commune. Soins de maternité en région rurale. *Can J Rural Med* 2012;17:135-41; sommaire en français à la page 142 : http://srpc.ca/rr2013/thebus/jpponmc.pdf.
6. Grzybowski S, Stoll K, Kornelsen J. Distance matters: a population based study examining access to maternity services for rural women. *BMC Health Serv Res* 2011;11:147.

President's message. Rural generalism

John Soles, MD, FRRMS
Clearwater, BC

Correspondence to:
John Soles;
johnasoles@gmail.com

When I was a child living in a rural community, rural generalists cared for most of the medical needs of the community. Simple and complex obstetrics, a wide variety of surgical procedures, emergency care, and most inpatient and outpatient care were provided by generalists. It was a somewhat uncommon event when a person left the community for medical care in the big city. In the last few decades this has changed. Our approach to health care has become increasingly specialized, and technology sometimes replaces clinical skills. This has resulted in health systems that are unduly expensive, not patient-centred and not meeting community needs. It has resulted in physicians who are overly specialized, or who are unwilling or unable to work to the full scope of their training. It has resulted in training programs that don't meet the needs of communities for generalists to provide the comprehensive, longitudinal medical care that community members require.

The first World Summit on Rural Generalist Medicine was held in Cairns, Australia, in October 2013. Out of this meeting came a consensus statement that has undergone dissemination and refinement over the last year and has been endorsed widely around the world. The Cairns Consensus Statement on Rural Generalist Medicine creates common principles that may be used and adapted by each participating country: 1) comprehensive primary care for individuals, families and communities; 2) hospital inpatient and/or related secondary medical care in the institutional, home or ambulatory setting; 3) emergency care; 4) extended and evolving service in 1 or more areas of focused cognitive and/or procedural practice as required to sustain needed health services locally among a network of colleagues; 5) a population health approach that is relevant to the community.[1]

Canadians living in rural communities deserve this approach to their medical care. Our patients need physicians who know them and their illnesses, who understand their social circumstances, who have an appreciation of them as individuals, and who are able to provide the bulk of medical services close to home with competence and confidence. Too-often-exaggerated concerns about medical "risk," lack of training or lack of confidence among rural physicians, and policies implemented at provincial or regional levels have led to the loss of services in our rural communities.

We need better tools for assessing community need and for determining whether existing or proposed programs meet this need. We need rurally relevant research so that when the quality or appropriateness of our care is questioned, evidence may trump urban-specialist or administrator opinion. We need to choose individuals for our training programs who are most suited to be rural generalists. We need better educational programs for both current and future rural generalists. We can do better for rural Canada.

REFERENCE

1. Cairns consensus statement on rural generalist medicine. Final draft version May 22, 2014. Available: www.srpc.ca/PDF/CairnsConsensus.pdf (accessed 2014 Dec. 4).

Message du président. Le généralisme rural

John Soles, MD, FRRMS
Clearwater (C.-B.)

Correspondance :
John Soles;
johnasoles@gmail.com

Enfant, je vivais dans une communauté rurale et les généralistes ruraux répondaient à la plupart des besoins médicaux de la communauté. Des généralistes se chargeaient des interventions simples et complexes en obstétrique, d'un vaste éventail d'interventions chirurgicales, des soins d'urgence et de la plupart des soins aux patients hospitalisés et en clinique externe. Il était assez rare qu'une personne quitte la communauté pour aller se faire soigner dans une grande ville, ce qui a changé au cours des dernières décennies. Notre approche des soins de santé est devenue de plus en plus spécialisée, et la technologie remplace parfois les compétences cliniques. Il en est résulté des systèmes de santé indûment coûteux, qui ne sont pas axés sur le patient et ne répondent pas aux besoins de la communauté. Il en est résulté des médecins trop spécialisés, qui ne veulent pas ou ne peuvent pas occuper le champ complet de leur formation. Il en est résulté des programmes de formation qui ne fournissent pas aux communautés les généralistes capables de dispenser les soins médicaux longitudinaux complets dont leur population a besoin.

Le premier Sommet mondial sur la médecine générale en milieu rural a eu lieu à Cairns, en Australie, en octobre 2013. L'assemblée a produit une déclaration de consensus qui a été diffusée et améliorée au cours de la dernière année et généralement approuvée dans le monde entier. La Déclaration de consensus de Cairns sur la médecine générale en milieu rural établit des principes communs que chaque pays participant peut utiliser et adapter: 1) soins de base complets pour les personnes, les familles et les communautés; 2) hospitalisation de patients et(ou) soins médicaux secondaires en milieu institutionnel, résidentiel ou ambulatoire; 3) soins d'urgence; 4) services complémentaires variés tels que des services psychologiques ou d'autres actes médicaux nécessaires au maintien des services de santé essentiels dispensés par un réseau de médecins dans une communauté donnée; 5) une approche axée sur la santé de la populations et adaptée aux besoins de chaque communauté.

Les Canadiens des communautés rurales méritent que leurs soins médicaux soient abordés de cette façon. Nos patients ont besoin de médecins qui les connaissent et connaissent leurs maladies, comprennent leur contexte social, les apprécient en tant que personnes et sont capables de fournir le gros des services médicaux près de leur domicile, avec compétence et confiance. Des préoccupations trop souvent exagérées au sujet du « risque » médical et du manque de formation ou de confiance chez les médecins ruraux, et des politiques mises en œuvre à l'échelle provinciale ou régionale sont à l'origine de la disparition de services dans nos communautés rurales.

Nous avons besoin de meilleurs outils pour évaluer les besoins de la communauté et pour déterminer si les programmes existants ou proposés y répondent. Nous avons besoin de recherches pertinentes pour le milieu rural afin les preuves puissent l'emporter sur l'opinion des spécialistes ou des administrateurs des milieux urbains lorsque l'on remet en question la qualité ou la pertinence de nos soins. Nous devons choisir dans nos programmes de formation les personnes les plus aptes à devenir généralistes en milieu rural. Nous avons besoin de meilleurs programmes de formation des généralistes ruraux tant d'aujourd'hui que de demain. Nous pouvons faire mieux pour le Canada rural.

RÉFÉRENCE

1. Déclaration de consensus de Cairns sur la médecine générale en milieu rural. Version préliminaire définitive. Le 22 mai 2014. En ligne: http://www.ruralgeneralismsummit.net/fr/wp-content/uploads/sites/2/2014/09/D%C3%A9claration-de-consensus-de-Cairns-sur-la-m%C3%A9decine-g%C3%A9n%C3%A9rale-en-milieu-rural.pdf (consulté le 4 décembre 2014).

Canadian Journal of Rural Medicine
CJRM CMR
Journal canadien de la médecine rurale

Original Article
Article original

Management of acute exacerbation of COPD in rural Alberta emergency departments

Paul McKenna, MD
Kelsey MacLeod, MD
Christopher Le, MD
Kevin Tok, MD
Jessie Ursenbach, MD
Lindsey Sutherland, MD, MSc
Faculty of Medicine and Dentistry, University of Alberta, Edmonton, Alta.

Lindsay Gaudet, BSc
Department of Emergency Medicine and School of Public Health, University of Alberta, Edmonton, Alta.

Stephanie Couperthwaite, BSc
Department of Emergency Medicine, University of Alberta, Edmonton, Alta.

Cristina Villa-Roel, MD
Brian H. Rowe, MD, MSc
Department of Emergency Medicine, Faculty of Medicine and Dentistry, and School of Public Health, University of Alberta, Edmonton, Alta.

Correspondence to:
Brian Rowe;
brian.rowe@ualberta.ca

This article has been peer reviewed.

Introduction: Acute exacerbation of chronic obstructive pulmonary disease (COPD) is a common presentation to emergency departments (EDs); however, limited information exists about the management of this condition in nonurban locations. We sought to examine the diagnostic and treatment approaches for acute exacerbation of COPD in 3 rural EDs, and to determine levels of adherence to recommendations from the Canadian Thoracic Society (CTS) clinical practice guideline.
Methods: We conducted retrospective chart reviews to explore the management of patients who presented to 3 rural EDs for acute exacerbation of COPD in 2011. Data are reported as medians and interquartile ranges (IQRs) and proportions.
Results: Over a 1-year period, 192 patients presented a total of 266 times with acute exacerbation of COPD. The median age was 68 (IQR 58–77) years, and 54.9% of the patients were women. Diagnostic testing included chest radiography in 65.0%, blood tests in 45.1%, electrocardiography in 33.5%, and arterial blood gas tests in 6.4%; only a few patients received pulmonary function testing. In the ED, 58.7% of patients were given a short-acting β-agonist, 48.9% a short-acting anticholinergic, 27.4% corticosteroids and 19.9% antibiotics. Overall, short-acting β-agonists (63.5%), anticholinergic agents (53.4%), corticosteroids (54.5%) and antibiotics (71.1%) were prescribed more commonly to discharged patients ($p < 0.05$ for all).
Conclusion: We found a low to moderate level of adherence to the CTS clinical practice guideline for the management of acute exacerbation of COPD in these rural EDs. Moreover, we identified gaps in both diagnostic and therapeutic care.

Introduction : Les cas d'exacerbation aiguë de la maladie pulmonaire obstructive chronique (MPOC) sont fréquents à l'urgence. Pourtant, il existe peu d'information sur la prise en charge de cette maladie en dehors des centres urbains. Nous voulions examiner les méthodes de diagnostic et de traitement de la MPOC utilisées dans 3 services d'urgence en milieu rural et savoir dans quelle mesure les lignes directrices de la Société canadienne de thoracologie (SCT) sont respectées.
Méthodes : Nous avons effectué une analyse rétrospective des dossiers pour examiner la prise en charge des patients s'étant présentés dans 3 services d'urgence en milieu rural en raison d'une exacerbation aiguë de la MPOC en 2011. Les données sont présentées en valeurs médianes et en intervalles interquartiles (II) et proportions.
Résultats : Sur une période d'un an, 192 patients se sont présentés au total 266 fois pour exacerbation aiguë de la MPOC. L'âge médian était de 68 ans (II 58–77); 54,9% des patients étaient des femmes. Les tests diagnostiques comprenaient des radiographies pulmonaires dans 65% des cas, des analyses sanguines dans 45,1% des cas, un électrocardiogramme dans 33,5% des cas et une analyse des gaz artériels dans 6,4% des cas; seuls quelques patients ont subi un test de la fonction pulmonaire. À l'urgence, 58,7% des patients ont reçu un β-2 agoniste à action rapide, 48,9%, un anticholinergique à action rapide, 27,4%, un corticostéroïde et 19,9%, un antibiotique. Dans l'ensemble, les β-2 agonistes à action rapide (63,5%), les anticholinergiques (53,4%), les corticostéroïdes (54,5%) et les antibiotiques (71,1%) étaient les agents prescrits le plus souvent aux patients recevant leur congé de l'hôpital ($p < 0,05$ pour tous).

Conclusion : Nous avons observé que le degré d'observance des lignes directrices de la SCT variait de faible à moyen dans les services d'urgence en milieu rural. De plus, nous avons observé des lacunes autant en ce qui concerne les tests diagnostiques que les soins thérapeutiques.

Chronic obstructive pulmonary disease (COPD) is one of the most common respiratory conditions in the developed world. Acute exacerbations of COPD can lead to use of health care, emergency department (ED) visits, hospital admissions and death.[1] Acute exacerbation of COPD is defined by the Canadian Thoracic Society (CTS) as "a sustained worsening of dyspnea, cough or sputum production leading to an increase in the use of maintenance medications and/or supplementation with additional medications."[2] In Alberta, patients with acute exacerbation of COPD who are 55 years of age or older present to one of more than 100 EDs in the province about every 37 minutes.[3]

To assist emergency and family physicians with effective management of this condition, several clinical practice guidelines have been developed and disseminated. The CTS produced the most commonly available and referenced guideline in Canada.[2] The development of this guideline involved a multidisciplinary team, clear search strategies, a risk-of-bias assessment, grading of evidence and iterative feedback with the goal of providing accurate, timely and relevant information for clinicians dealing with acute exacerbation of COPD. Although physicians consider clinical practice guidelines to be useful tools, data are lacking on the impact of clinical practice guidelines on patient outcomes in rural settings.

In this study, we sought to explore the diagnosis and management of acute exacerbation of COPD in 3 rural EDs, and to assess adherence to recommendations from the CTS clinical practice guideline.

METHODS

Study settings

We conducted this study in 3 rural teaching hospitals in the towns of Edson (2011 population: 8365), Hinton (2011 population: 9825) and Whitecourt (2011 population: 9202) in Alberta. Throughout the study, site data are anonymous. These communities are medically staffed by family physicians and other health care professionals, and periodically receive visiting medical specialists. All 3 communities maintain acute care hospitals, which are managed by Alberta Health Services. Staff at these health care units accept medical students and family medicine residents for elective and selective training periods. The local family physicians provide 24-hour coverage of the ED and are occasionally relieved by short-term locum physicians.

Case selection

We conducted retrospective chart reviews to explore the diagnosis and ED management of consecutive patients who presented for acute exacerbation of COPD during the 2011 calendar year (Jan. 1–Dec. 31). We then described the management and compared it to diagnostic and treatment recommendations from the CTS guideline (Table 1).

Charts coded for COPD (J41–44) based on the International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10) were selected for review. Charts were not excluded based on patient age, sex, smoking history or severity of disease. Each presentation during the study period was documented as a separate case. Repeat presentations within 7 days were not included, because these events were felt to be the continuation of the same event.

Data collection

Research assistants collected data from the full-paper charts directly onto standardized collection forms at the site of the hospital visit. The completed data collection forms were collected centrally at the Department of Emergency Medicine at the University of Alberta, for entry by experienced research data personnel into a Microsoft Access database. The data were checked for inconsistencies, which were resolved by checking the data collection forms.

The data collected included the following: 1) patient demographics; 2) patient flow times (e.g., time of triage, bed assignment, doctor assessment, either discharge from ED or inpatient admission times, and time of discharge after inpatient admission, if applicable); 3) vital signs (e.g., respiration rate, pulse rate, temperature, oxygen saturation by oximetry); 4) diagnostic tests (e.g., peak expiratory flow [PEF] or forced expiratory volume in 1 second

[FEV_1], chest radiography, electrocardiography [ECG], and blood tests, including complete blood count, electrolytes, cardiac enzymes and blood gas panel); 5) mode of arrival and interventions/treatments by emergency medical services (EMS) and/or in the ED; and 6) patient disposition and repeat visit to the ED within 14 days of discharge from the ED or, where the patient was admitted to hospital, after discharge from hospital admission. We also checked ED records for spirometry taken before and after administration of a bronchodilator on the day of the visit.

Statistical analysis

Descriptive data are presented as proportions for categorical variables and means with standard deviations (SDs), or medians with interquartile ranges (IQRs), as appropriate for continuous variables. Statistical analysis was done using the Student *t* test, with significance indicated by $p < 0.05$. Data were analyzed using Stata 11 software.

Sample size

Given the limited funding for this study, there was a need to balance the work for the research team with the ideal sample size. We endeavoured to examine all charts for 1 year and anticipated about 100 charts at each site. This sample provided reasonable estimates around midrange (e.g., at 50%, the 95% confidence interval (CI) was ± 9%) as well as low (e.g., at 10%, the 95% CI for 100 observations was 6%) incidence observations. Assuming homogeneity, the goal was to obtain 300 total charts to provide narrower 95% CIs for midrange (± 6%) and low (± 3%) incidence observations. To obtain 95% CIs approximating ± 1%, more than 1000 charts for each location would be required, which was untenable.

The study was approved by the University of Alberta's Health Research Ethics Board. Patient charts were accessed and data were collected in accordance with the guidelines set out by the board. Patients were not contacted during this study.

RESULTS

Patients and transport

A total of 266 cases were reviewed from 192 unique patients who presented 1 or more times to one of the 3 EDs for treatment of acute exacerbation of COPD. The sex ratio of patients slightly favoured women, and the median age was 68 (IQR 58–77) years. Significantly more female patients presented to Site 3 than to the other sites; patients at Site 3 were also younger (Table 2). In 40 cases, patients were transported by

Table 1. Recommendations for the diagnosis and treatment of acute exacerbation of chronic obstructive pulmonary disease from the Canadian Thoracic Society guideline (2007 update)[2]

Recommendation	In the ED	At ED discharge
Diagnosis		
Chest radiograph	Recommended for all patients presenting to the ED	NA
Peak flow measurement	Not clearly addressed	NA
Pulse oximetry	Not clearly addressed	NA
Arterial blood gas test	Recommended for patients with low oxygen saturation on oximetry	NA
Sputum sample	Consider for patients with very poor lung function, with frequent exacerbations or who have been taking antibiotics in the preceding 3 mo	NA
Treatment		
Inhaled β-agonists	• Short-acting recommended • Long-acting not recommended	• As needed • Combined with inhaled corticosteroid as second-line chronic therapy
Inhaled anticholinergics	• Short-acting recommended • Long-acting not recommended	• As needed • First-line chronic therapy
Systemic corticosteroids	Recommended for moderate to severe exacerbations in ED and at discharge	For patients with Anthonisen type-1 and -2 exacerbations*
Antibiotics	Consider for patients with purulent exacerbations	For patients with Anthonisen type-1 and -2 exacerbations*
Supplemental oxygen	Not addressed	For chronic hypoxemia
Noninvasive ventilation	As required for respiratory failure before intubation	NA

ED = emergency department; NA = not applicable.
*The Anthonisen criteria are based on a self-reported history of dyspnea, increased sputum volume and/or increased sputum purulence. Patients with type 1 exacerbations report all 3 criteria, and those with type 2 exacerbations report 2 of 3 criteria.

ambulance. Overall, most (97.5%) transported patients received some EMS treatment; the most common EMS treatments are presented in Table 2. Of note, intravenous magnesium and corticosteroids were infrequently used (0 and 1 [2.5%], respectively).

ED assessment and management

Patients who presented to the ED at Site 1 had lower scores on the Canadian Triage and Acuity Scale (CTAS) than those who presented to the other 2 sites (Table 3). The frequency of common assessments for COPD in the ED varied among sites. A summary of vital signs and ED assessments is presented in Table 3. Testing for PEFs was not reported frequently overall, and not at all in patients from Site 2. Most patients (58.7%) received salbutamol, an inhaled short-acting β-agonist (SABA) in the ED; however, the method of administration differed significantly among sites (Table 4). Oral prednisone was used most commonly (72.6%); the use of intravenous (IV) corticosteroids was low at all 3 sites. Overall, 19.9% of patients received guideline-approved antibiotics (i.e., macrolides, fluoroquinolones and doxycycline). Administration of inhaled corticosteroid medication and oxygen in the ED varied among sites (Table 4).

Disposition decisions

Most patients (205, 77%) were discharged from the hospital, and the majority of those were discharged home (189, 92%) (Table 5). Other patients were discharged elsewhere, such as to a nursing home. Six patients were transferred for immediate hospital admission to the nearest major centre, in Edmonton. Overall, 61 admissions occurred, but 2 patients were later transferred to Edmonton. Most admitted patients (59, 97%) were assigned to a medical floor in the hospital to which they initially presented. Median length of stay (LOS) for admitted patients was 4 (IQR 2–6) days. Patients who were admitted to hospital were more likely to receive antibiotics (odds ratio [OR] 2.96, 95% confidence interval [CI] 1.45–6.05), corticosteroids (OR 3.14, 95% CI 1.59–6.25) or both (OR 2.48, 95% CI 1.11–5.53) in the ED (Figs. 1 and 2).

Post-ED treatment

Medications that were commonly prescribed to treat acute exacerbation of COPD at discharge from the ED or admission are summarized in Table 5. Briefly, antibiotics (71.1%) were the most frequently prescribed medication at ED discharge, followed by SABA agents (63.5%). Patients who were admitted to the hospital were more likely to receive antibiotics (OR 2.16, 95% CI 1.01–4.72) in hospital than patients who were discharged from the ED; however, there was no difference in corticosteroid prescriptions (OR 1.54, 95% CI 0.83–2.89) or both (OR 1.79, 95% CI 0.97–3.32) at discharge (Figs. 1 and 2).

The likelihood of a return visit within 14 days correlated to the percentage of patients at each site who were sent home with antibiotics, corticosteroids or both; however, it is unclear whether this correlation is due to treatment or other factors such as disease severity.

The results shown in Tables 1–5 indicate that there was low to moderate adherence to the recommendations in the CTS clinical practice guideline for the management of acute exacerbation of COPD.

DISCUSSION

High-quality care in EDs for acute exacerbation of COPD is timely, equitable, effective, efficient, patient-centred and safe.[4] Although it is difficult to

Table 2. Characteristics of 266 cases of acute exacerbation of chronic obstructive pulmonary disease at 3 rural emergency departments

Characteristic	No. (%) of cases*			
	Site 1 *n* = 76	Site 2 *n* = 94	Site 3 *n* = 96	Total *n* = 266
Sex, female	36 (47.4)	50 (53.2)	60 (62.5)	146 (54.9)
Age, median (IQR), yr	71 (62–77)	69 (61–80)	65 (53–71)	68 (58–77)
EMS treatment	20 (26.3)	10 (10.6)	10 (10.4)	40 (15.0)
Oxygen	17/20 (85.0)	9/10 (90.0)	9/10 (90.0)	35/40 (87.5)
SABA	7/20 (35.0)	4/10 (40.0)	5/10 (50.0)	16/40 (40.0)
SAAC	6/20 (30.0)	1/10 (10.0)	3/10 (30.0)	10/40 (25.0)
Other	2/20 (10.0)	0	0	2/40 (5.0)

EMS = emergency medical services; IQR = interquartile range; SAAC = short-acting anticholinergics; SABA = short-acting β-agonists.
*Unless stated otherwise.

Table 3. Assessment and investigation of 266 cases of acute exacerbation of chronic obstructive pulmonary disease at 3 rural emergency departments

Variable	No. (%) of cases*			
	Site 1 *n* = 76	Site 2 *n* = 94	Site 3 *n* = 96	Total *n* = 266
CTAS score				
2	6 (7.9)	10 (10.6)	9 (9.4)	25 (9.4)
3	26 (34.2)	43 (45.7)	42 (43.8)	111 (41.7)
4–5	36 (47.4)	40 (42.6)	38 (39.6)	114 (42.9)
Not recorded	8 (10.5)	1 (1.1)	7 (7.3)	16 (6.0)
Vital signs, median (IQR)*				
Respiratory rate, breaths/min	22 (18–24)	20 (18–24)	20 (18–22)	20 (18–24)
Pulse rate, beats/min	92 (78–106)	87 (72–97)	91 (80–105)	89 (77–103)
Temperature, ºC	36.5 (36.2–36.9)	36.5 (36.2–37.4)	36.7 (36.3–37.1)	36.5 (36.2–37.0)
Temperature ≥ 38ºC, no. (%)	13 (17.1)	7 (7.4)	9 (9.4)	29 (10.9)
Oxygen saturation on room air, %	92 (84–95)	93 (87–95)	93 (90–95)	93 (89–95)
PEF obtained, no. (%)	8 (10.5)	0	5 (5.2)	13 (4.9)
Earliest PEF, L/min	170 (100–340)	—	150 (150–275)	170 (140–293)
ED investigations				
Chest radiography	42 (55.3)	67 (71.3)	64 (66.7)	173 (65.0)
Electrocardiography	29 (38.2)	33 (35.1)	69 (71.9)	89 (33.5)
Sputum sample	1 (1.3)	1 (1.1)	6 (6.3)	8 (3.0)
Blood cultures	6 (7.9)	5 (5.3)	1 (1.0)	12 (4.5)
Blood tests	33 (43.4)	42 (44.7)	45 (46.9)	120 (45.1)
CBC	33/33 (100.0)	40/42 (95.2)	44/45 (97.8)	117/120 (97.5)
Electrolytes	27/33 (81.8)	41/42 (97.6)	35/45 (77.8)	103/120 (85.8)
Cardiac enzymes	21/33 (63.6)	24/42 (57.1)	18/45 (40.0)	63/120 (52.5)
ABG	6 (7.9)	10 (10.6)	1 (1.0)	17 (6.4)
pH, median (IQR)	7.4 (7.3–7.5)	7.4 (7.3–7.4)	7.4	7.4 (7.3–7.4)
Pa_{CO_2}, median (IQR), mm Hg	46.9 (42.2–63.0)	43.4 (33.7–100.7)	63.0	44.1 (38.4–63)
Pa_{O_2}, median (IQR), mm Hg	86 (53–160)	58 (52–76)	55.0	58 (52.5–123)

ABG = arterial blood gas; CBC = complete blood count; CTAS = Canadian Triage and Acuity Scale; ECG = electrocardiography; ED = emergency department; IQR = interquartile range; Pa_{O_2} = partial pressure of oxygen in arterial blood; Pa_{CO_2} = partial pressure of carbon dioxide in arterial blood; PEF = peak expiratory flow.
*Unless stated otherwise.

Table 4. Management of 266 cases of acute exacerbation of chronic obstructive pulmonary disease at 3 rural emergency departments

Variable	No. (%) of cases*			
	Site 1 *n* = 76	Site 2 *n* = 94	Site 3 *n* = 96	Total *n* = 266
Inhaled SABA	42 (55.3)	64 (68.1)	50 (52.1)	156 (58.7)
ED dose, median (IQR), mg	2.5 (2.5–5.0)	5.0 (2.5–8.8)	5 (5–10)	5 (2.5–7.5)
Inhaled SAAC	31 (40.8)	53 (56.4)	46 (47.9)	130 (48.9)
ED dose, median (IQR), mg	0.5 (0.5–1.0)	0.5 (0.5–1.5)	0.4 (0.3–0.7)	0.5 (0.3–1.0)
Inhaled SAAC and SABA	31 (40.8)	53 (56.4)	46 (47.9)	130 (48.9)
Corticosteroids	18 (23.7)	32 (34.0)	23 (23.9)	73 (27.4)
Prednisone	7/18 (38.9)	29/32 (90.6)	17/23 (73.9)	53 (72.6)
Antibiotics	10 (13.2)	30 (31.9)	13 (13.5)	53 (19.9)
Most common	Fluoroquinolone	Doxycycline	Cephalosporin	Cephalosporin
	4/10 (40.0)	11/30 (36.7)	6/13 (46.2)	14/49 (28.6)
Assisted ventilation	2 (2.6)	3 (3.2)	1 (1.0)	6 (2.3)
Other COPD treatments	20 (26.3)	40 (42.6)	34 (35.4)	94 (35.3)
Oxygen	8/20 (40.0)	30/40 (75.0)	23/34 (67.7)	61/93 (65.6)
Inhaled corticosteroids	12/20 (60.0)	10/40 (25.0)	18/34 (52.9)	40/93 (43.0)

COPD = chronic obstructive pulmonary disease; ED = emergency department; IQR = interquartile range; SAAC = short-acting anticholinergics; SABA = short-acting β-agonists.
*Unless stated otherwise.

retrospectively "grade" the true quality of a clinical interaction, adoption of management recommendations from COPD guidelines would represent markers, albeit incomplete, of high-quality care. This study employed standard guideline and quality markers to examine the overall quality of care delivered in 3 EDs in rural Alberta.

The CTAS scores and outcomes of these patients suggest a lower acuity than seen in larger urban centres.[5] In a rural setting, patients who would otherwise see their family physician might be told that their physician is working in the ED and be sent there for treatment, thus resulting in an ED population with lower-acuity conditions. Whereas only 4.9% of patients received PEF testing and 6.4% had ABG test results recorded, all patients had oxygen saturation recorded during measurement of vital signs. These data indicate that concordance with recommended diagnostic testing is not optimal in these 3 rural EDs. Many urban hospitals in Canada have respiratory therapists dedicated to their ED; however, this is not the case for these 3 hospitals and many other rural EDs. This may contribute to the lower proportion of patients receiving measurements of airway obstruction in these and other rural EDs.

It was encouraging that 65% of patients received chest radiography as part of their workup. The CTS guidelines recommend chest radiography for all patients presenting to the ED with symptoms consistent with an acute exacerbation of COPD because the test has been shown to change management in 16%–21% of patients.[6,7] Many urban hospitals in Canada have dedicated ED radiology services and 24-hour in-house coverage; however, this is not the case for these 3 hospitals (i.e., call backs are required) and many other rural EDs. This may contribute to the lower proportion of patients receiving chest radiography in these and other rural EDs. For patients whose management did not adhere to recommendations, we were unable to examine whether this was because of lower acuity or some other factor.

Table 5. Outcomes and post–emergency department treatment in 266 cases of acute exacerbation of chronic obstructive pulmonary disease at 3 rural emergency departments

	No. (%) of cases*							
Variable	Site 1 *n* = 76		Site 2 *n* = 94		Site 3 *n* = 96		Total *n* = 266	
Discharged	54	(71.1)	71	(75.5)	80	(83.3)	205	(77.1)
Home	50/54	(92.6)	64/71	(90.1)	75/80	(93.8)	189/205	(92.2)
Transferred	1/54	(1.8)	5/71	(7.0)	0		6/205	(2.9)
Treatment								
Antibiotics	34/54	(62.9)	41/71	(57.7)	64/80	(80.0)	139	(67.8)
Corticosteroids	20/54	(37.0)	33/71	(46.5)	53/80	(66.2)	106	(51.7)
Corticosteroids and antibiotics	12/54	(22.2)	27/71	(38.0)	49/80	(61.2)	88/205	(42.9)
Post-ED outcome								
ED LOS, median (IQR), h	1.7	(1.3–2.4)	2.2	(1.1–2.8)	1.6	(1.2–2.5)	1.7	(1.2–2.6)
Returned to the ED < 14 d	7/54	(12.9)	10/71	(14.1)	17/80	(21.3)	34/205	(16.6)
Hospital admission < 14 d	1/54	(1.8)	0		3/80	(3.8)	4/205	(1.9)
Admitted	22	(28.9)	23	(24.5)	16		61	(22.9)
Transferred	2/22	(9.1)	0		0		2/61	(3.3)
ED LOS, median (IQR), h	1.9	(1.3–3.8)	3.1	(2.5–6.6)	2.2	(1.3–3.6)	2.5	(1.7–3.8)
Hospital LOS, median (IQR), d	4	(3–7)	3	(1–5)	4	(3–11)	4	(2–6)
Post-ED treatment								
Inhaled corticosteroids	15	(19.7)	8	(8.5)	26	(27.1)	49	(18.4)
SABA	54	(71.1)	48	(51.1)	67	(69.8)	169	(63.5)
Inhaled anticholinergics	40	(52.6)	30	(31.9)	72	(75.0)	142	(53.4)
SABA and SAAC	10	(13.2)	3	(3.2)	1	(1.0)	14	(5.3)
Inhaled corticosteroids and LABA	29	(38.2)	29	(30.8)	51	(53.1)	109	(40.9)
Antibiotics	51	(67.1)	62	(65.9)	76	(79.2)	189	(71.1)
Theophylline	7	(9.2)	0		5	(5.2)	12	(4.5)
Corticosteroids	34	(44.7)	48	(51.1)	63	(65.6)	145	(54.5)
Other medication	7	(9.2)	1	(1.1)	13	(13.5)	21	(7.9)

ED = emergency department; IQR = interquartile range; LABA = long-acting β-adrenoceptor; LOS = length of stay; SAAC = short-acting anticholinergics; SABA = short-acting β-agonists.
*Unless stated otherwise.

Overall, the low rate of quantitative assessment of severity for patients with acute exacerbation of COPD, including PEF and ABG measurement, suggests that physicians might rely more heavily on triage scores, vital signs, subjective reporting of symptoms, and/or clinical gestalt in determining severity. Moreover, more sophisticated measurement techniques and personalized medicine appear to be an unlikely solution for these centres.[8] Further research into the reliability and validity of practical tools for severity assessment is warranted.

We found that 65.6% of patients received supplemental oxygen, 58.7% received inhaled SABAs and 48.9% received inhaled SAACs in the ED. Systemic corticosteroids were administered to only 27.4% of patients in the ED and prescribed to 54.5% of patients on discharge. Antibiotics were administered to only 19.9% of patients in the ED and prescribed to 71.1% of patients on discharge. Consistency with guideline recommendations was improved in the outpatient setting.

Corticosteroids are effective for the treatment of COPD to prevent treatment failure after hospital admission[9] and to reduce relapse after discharge.[10] The only metric related to COPD listed in the 2010 report of the Institute for Clinical Evaluative Sciences[11] that relates to ED quality of care in Canada is the percentage of patients with COPD who receive corticosteroid therapy in the ED and at discharge. Our results indicate that only slightly more than one-quarter of patients (27.4%) received corticosteroids in the ED and slightly more than half (54.5%) were taking corticosteroids as post-ED treatment. Overall, management adherence to clinical practice guidelines was only moderate; however, medical management adhered to guideline recommendations better than diagnostic assessment.

Comparable literature pertaining to rural medicine is scarce. However, Tsai and colleagues[12] conducted a similar study in 2 academic urban EDs in Boston and found overall higher levels of concordance with established clinical practice guidelines than we found in our study. In addition, multicentre Canadian data pertaining to acute exacerbation of COPD suggest more ED admissions,[5] more common investigations and higher adherence to ED and post-ED management recommendations from clinical practice guidelines in urban centres than in the rural centres examined here.[3] In addition, both US[13] and Canadian[5,14] data demonstrate higher use of antibiotics and corticosteroids at discharge from hospital. A recent study of patients with acute exacerbation of COPD in a Canadian tertiary care centre identified similar gaps in management (e.g., 58% received corticosteroids and 84% antibiotics); however, the study was restricted to admitted patients.[14]

Limitations

Our study had several limitations that require discussion. Our data from these rural hospitals could have several different implications. The overall average severity of disease seen in this study may have been low, thus warranting the limited diagnostic assessment and treatment strategies observed. Alternatively, there may be gaps in the knowledge translation between research and practice at several different levels. The most feasible gap might be the dissemination and point-of-care use of clinical practice guidelines in the ED setting.

With the relatively low number of physicians working in these communities, the practices of 1 or 2 physicians could affect the results to a large degree. Also, these 3 EDs in Alberta likely do not represent all rural sites, either provincially or nationally.

This study's methods were retrospective, and issues such as missing data and unrecorded measures would reduce the confidence in the data. For example, determining the appropriateness of antibiotic therapy based on the Anthonisen criteria was not always possible owing to the lack of detailed charting of symptoms.[15] Despite this, recording of medications by nurses is mandatory, giving credence to the collected data, and we completed training using medical students

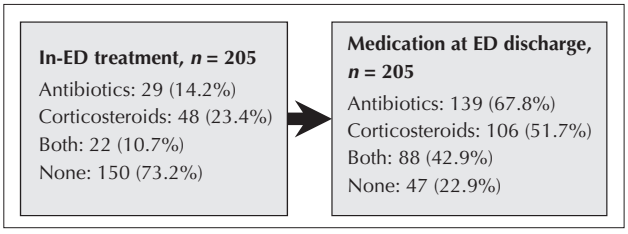


Fig. 1. Emergency department (ED) treatment and medication at discharge in 205 patients with acute exacerbation of chronic obstructive pulmonary disease.

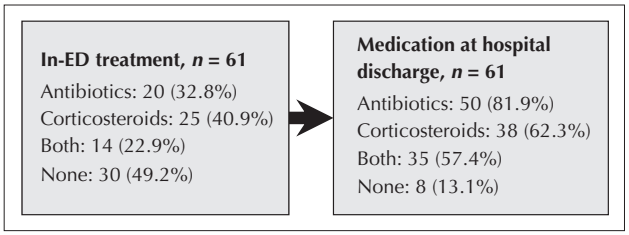


Fig. 2. Emergency department (ED) treatment and medication at hospital admission in 61 patients with acute exacerbation of chronic obstructive pulmonary disease.

practising in these rural locations who had no pre-existing biases.

It was difficult to comment on appropriateness of care for patients who were not given management consistent with guidelines, because quantitative measures of severity of acute exacerbation of COPD (e.g., vital signs, PEF, ABG) were often not documented. Also, patients were not assessed in follow-up so the effectiveness of therapy could not be determined. Finally, sampling bias may have influenced the results, because the medical record coding of COPD was not validated.

Future research

Research could be undertaken to compare our results from rural EDs with similar presentations in an urban or academic ED. Differences in diagnosis and management may be found due to setting, population, availability of reliable follow-up or physician scope of practice (e.g., rural family physician v. full-time emergency physician). Alberta has developed urban computer-based electronic clinical practice guidelines; availability to physicians working in rural EDs is planned and should be evaluated.[16,17] Adherence to recommendations within respiratory and other electronic clinical practice guidelines may improve with higher usage of these guidelines,[18] even at community and rural sites.[19] Further research might re-examine guideline adherence with easier and less cumbersome access to electronic clinical practice guidelines or more encouragement from administration to use these guidelines.

CONCLUSION

We found a low to moderate level of adherence to the CTS clinical practice guideline in management of acute exacerbation of COPD in these rural EDs. Moreover, we identified gaps in both diagnostic and therapeutic care in these EDs. We identified low adherence associated with diagnostic testing and moderate adherence associated with medical management. The causes of these findings require further research.

Acknowledgements: The authors thank the medical records staff in Edson, Hinton and Whitecourt for assistance with this study, as well as the clinical preceptors in these locations for their supervision, mentorship and support.

Competing interests: None declared.

Funding: The study was supported in part by the Emergency Medicine Research Group affiliated with the Department of Emergency Medicine, University of Alberta. Cristina Villa-Roel is supported by Canadian Institutes of Health Research (CIHR) in partnership with the Knowledge Translation Branch (Ottawa, Ont.). Brian Rowe's research is supported by CIHR through a Tier I Canada Research Chair in Evidence-based Emergency Medicine (Ottawa, Ont.).

REFERENCES

1. Akinbami LJ, Liu X. Chronic obstructive pulmonary disease among adults aged 18 and over in the United States, 1998–2009. *NCHS Data Brief* 2011;(63):1-8.
2. O'Donnell DE, Aaron S, Bourbeau J, et al. Canadian Thoracic Society recommendations for management of chronic obstructive pulmonary disease — 2007 update. *Can Respir J* 2007;14:5B-32B.
3. Rowe BH, Voaklander DC, Marrie TJ, et al. Outcomes following chronic obstructive pulmonary disease presentations to emergency departments in Alberta: a population-based study. *Can Respir J* 2010; 17:295-300.
4. Institute of Medicine Committee on the Future of Emergency Care in the U.S. Health System. *Hospital based emergency care: at the breaking point*. Washington (DC): The National Academies Press; 2006.
5. Rowe BH, Villa Roel C, Guttman A, et al. Predictors of hospital admissions for chronic obstructive pulmonary disease exacerbations in to Canadian emergency departments. *Acad Emerg Med* 2009;16:316-24.
6. Emerman CL, Cydulka RK. Evaluation of high-yield criteria for chest radiography in acute exacerbation of chronic obstructive pulmonary disease. *Ann Emerg Med* 1993;22:680-4.
7. Tsai TW, Gallagher EJ, Lombardi G, et al. Guidelines for the selective ordering of admission chest radiography in adult obstructive airway disease. *Ann Emerg Med* 1993;22:1854-8.
8. Adamko DJ, Sykes BD, Rowe BH. The metabolomics of asthma: novel diagnostic potential. *Chest* 2012;141:1295-302.
9. Walters JA, Gibson PG, Wood-Baker RR, et al. Systemic corticosteroids for acute exacerbations of chronic obstructive pulmonary disease. *Cochrane Database Syst Rev* 2009;1:CD001288.
10. Aaron S, Vandemheen K, Hebert P, et al. Outpatient oral prednisone after emergency treatment of chronic obstructive pulmonary disease. *N Engl J Med* 2003;348:2618-25.
11. Schull MJ, Guttmann A, Leaver CA, et al. Prioritizing performance measurement for emergency department care: consensus on evidence-based quality of care indicators. *CJEM* 2011;13:300-9.
12. Tsai CL, Ginde AA, Blanc PG, et al. Improved care of acute exacerbation of chronic obstructive pulmonary disease in two academic emergency departments. *Int J Emerg Med* 2009;2:111-6.
13. Kim S, Emerman CL, Cydulka RK, et al. Prospective multicenter study of relapse following emergency department treatment of COPD exacerbation. *Chest* 2004;125:473-81.
14. Sandhu SK, Chu J, Yurkovich M, et al. Variations in the management of acute exacerbations of chronic obstructive pulmonary disease. *Can Respir J* 2013;20:175-9.
15. Anthonisen N, Manfreda J, Warren P, et al. Antibiotic therapy in exacerbation of chronic obstructive pulmonary disease. *Ann Intern Med* 1987;106:196-204.
16. Lim C, Bawden JL, Wing A, et al. Febrile neutropenia in the emergency department: the role of an electronic clinical practice guideline. *Am J Emerg Med* 2012;30:5-11.
17. Bond CM, Djogovic D, Villa-Roel C, et al. Pilot study comparing sepsis management with and without electronic clinical practice guidelines in an academic emergency department. *J Emerg Med* 2013;44:698-708.
18. Rowe BH, Chahal AM, Spooner CH, et al. Increasing the use of anti-inflammatory agents in acute asthma in the emergency department: experience with an asthma care map. *Can Respir J* 2008;15:20-6.
19. Mackey D, Myles M, Spooner CH, et al. The use of an asthma care map in a community hospital emergency department. *CJEM* 2007;9:353-65.

Canadian Journal of Rural Medicine
CJRM CMR
Journal canadien de la médecine rurale

Original Article
Article original

General practitioner surgery: Anyone interested?

Amber A. P. Bacenas, MD, CCFP
Chelsey A. Ricketts, MD, CCFP
Department of Family Practice, University of British Columbia, Vancouver, BC

Jonathan Berkowitz, PhD
Sauder School of Business, University of British Columbia, Vancouver, BC

Nadine R. Caron, MD, MPH, FRCSC
Department of Surgery, University of British Columbia, Vancouver, BC

Correspondence to: Nadine Caron; caronn@unbc.ca

This article has been peer reviewed.

Introduction: We sought to assess awareness of, exposure to and interest in general practitioner (GP) surgery and enhanced surgical skills (ESS) among family practice residents in British Columbia, Alberta and Saskatchewan.
Methods: We distributed a survey to all family practice residents at 4 universities in BC, Alberta and Saskatchewan. The survey assessed demographic information, awareness of and exposure to GP surgery or ESS during training, and interest in pursuing formal ESS training.
Results: We received 174 responses (27.2% response rate). Numerous respondents were unaware of GP surgery (9.9% ± 4.5%) and ESS (17.9% ± 5.7%). Awareness was higher among respondents from rural hometowns (GP surgery and ESS awareness 100% and 94.1%, respectively), and with prior exposure to GP surgery (GP surgery and ESS awareness 96.9% and 95.4%, respectively). A minority (38.2%) had been exposed to GP surgery, with exposure higher in respondents from rural training sites and in their second postgraduate year (72.5% and 47.4%, respectively). A quarter (25.1%) of respondents were considering ESS training. Factors encouraging training included increased procedures, challenging medicine and impact on patient outcomes. The importance of ESS training opportunities and service was rated highly.
Conclusion: Many respondents were unaware of ESS as a career option. Exposure to GP surgery during training was associated with increased awareness. Furthermore, exposure fostered interest in this important field. These results may be helpful in the development of formal ESS training programs and in curricula for family practice residency programs.

Introduction : Nous avons cherché à savoir dans quelle mesure les résidents en médecine familiale de la Colombie-Britannique, de l'Alberta et de la Saskatchewan avaient entendu parler de la chirurgie pratiquée par des omnipraticiens (OP) et des techniques chirurgicales avancées (TCA), l'expérience qu'ils pouvaient en avoir eus au cours de leur formation et leur intérêt à cet égard.
Méthodes : Nous avons distribué un questionnaire à tous les résidents en médecine familiale de 4 universités de la Colombie-Britannique, de l'Alberta et de la Saskatchewan. Le sondage visait à recueillir des données démographiques et à évaluer la connaissance de la chirurgie pratiquée par des OP ou des TCA, l'expérience dans ce domaine au cours de la formation et l'intérêt pour une formation structurée en TCA.
Résultats : Nous avons reçu 174 réponses (taux de réponse de 27,2 %). De nombreux répondants n'avaient jamais entendu parler de chirurgie pratiquée par des OP (9,9 % ± 4,5 %) et de TCA (17,9 % ± 5,7 %). Les répondants issus de villes rurales étaient plus nombreux à être renseignés à ce sujet (chirurgie pratiquée par des OP, 100 %; TCA, 95,4 %), de même que ceux qui en avaient fait l'une expérience au cours de leur formation (chirurgie pratiquée par des OP et connaissance des TCA, 96,9 % et 95,4 % respectivement). Une minorité de répondants (38,2 %) avaient fait l'expérience de la chirurgie pratiquée par des OP; parmi ceux-ci, les répondants des sites de formation en milieu rural et ceux en deuxième année de formation postdoctorale étaient plus susceptibles d'en avoir fait l'expérience (72,5 % et 47,4 % respectivement). Le quart (25,1 %) des répondants songeaient à suivre une formation en TCA. Parmi les facteurs incitatifs, mentionnons le nombre plus élevé d'interventions, les défis qu'offre ce domaine de la médecine et l'impact sur les résultats des patients. Les répondants ont jugé très important d'avoir des occasions de suivre une formation en TCA et des possibilités de pratiquer dans ce domaine.

Conclusion : De nombreux répondants ignoraient que les TCA pouvaient être un choix de carrière. L'expérience de la chirurgie générale pratiquée par des omnipraticiens a été associée à une sensibilisation accrue. De plus, cette expérience a favorisé l'intérêt pour cet important domaine. Ces résultats pourraient être utiles à l'élaboration de programmes de formation structurés en TCA et de cours dans les programmes de résidence en médecine familiale.

INTRODUCTION

Delivery of surgical services in rural Canada has inherent challenges. Up to 30% of Canada's population resides in rural areas (defined by Statistics Canada as communities outside of urban areas with a population < 10 000), whereas only 2.5% of specialists practise in these rural environments.[1–3] Small communities distributed widely over Canada's complex geography make patient transfer difficult. To address these challenges in access to surgical care, a selected spectrum of emergent and elective surgeries are performed by general practitioner (GP) surgeons in hospitals serving rural communities.[4,5]

The historical and current contribution of GP surgeons in Canada is substantial, especially in the western provinces and territories. In the mid-1990s a Canadian survey found GP surgeons providing surgical services in 80% of rural hospitals in British Columbia, Alberta and the northern territories.[5] At that time 27% (15/56) of these hospitals relied completely on GP surgeons for provision of surgical services. The scope of practice within GP surgery has varied, ranging from cesarean deliveries exclusively to a wide spectrum of procedures across multiple surgical specialties. A 2008 study by Humber and Frecker documented the 15 most common procedures performed by GP surgeons in BC (Fig. 1).[6]

Decline of rural surgery

Centralization of health care over the past few decades has resulted in the closure of many rural surgical sites and, subsequently, obstetric services in these communities. In 2000, many rural communities in western Canada relied exclusively on GP surgery to maintain local surgical services; 20 out of 54 of these sites were in BC.[7] By 2007, 25% of these GP surgery programs were closed, leaving only 15 communities in rural BC with these vital surgical services.[4] Retirement of GP surgeons, lack of formal training and credentialing, and challenges with portability of privileges have likely contributed to this decline.[6,8]

Patients in these rural communities, now lacking GP surgery services, must travel to access basic surgical care that was previously available closer to home. Effects of these closures extend to adjacent communities within the GP surgery catchment area that also depended on these services. This is particularly unfortunate given a growing body of literature demonstrating that patients from rural communities value health care in familiar environments, and can experience serious financial and social stress as a consequence of medical travel.[9] Furthermore, safety profiles within the spectrum of surgical procedures performed by GP surgeons compare favourably with those performed by specialists in larger centres, even though their independent volume may be lower.[10–15]

Training in GP surgery

Alongside evolving medical education has come a change in terminology with the term enhanced surgical skills (ESS), now being adopted to replace GP surgery.[16] In this study, GP surgery and ESS describe the same skill set, with the term ESS reserved for current and future references to the field.

In 2013/14, the only active program in Canada for formal ESS training is administered through the University of Saskatchewan. To meet increasing demands on a fragile system, initiatives are underway to create additional formal ESS programs, especially in western Canada, where GP surgery has such historical roots.[17] It is unclear what level of interest exists for such programs among family practice residents, and to what degree they are even aware of ESS.

This study aimed to assess awareness of, exposure to and interest in GP surgery and ESS among trainees in family practice residency programs in BC, Alberta and Saskatchewan. Attitudes toward this field of practice are explored. An improved understanding of these factors will help to guide the creation and maintenance of ESS programs for family practitioners in Canada.

METHODS

Study population

We sent an anonymous, Web-based survey by listserv to all family practice residents at the University of British Columbia, University of Alberta, University of Calgary and University of Saskatchewan. The study population included all first- and second-year family practice residents at these universities who consented to complete the online survey. There were no exclusion criteria. A copy of the survey is available on request.

The Human Research Ethics Board at the University of British Columbia, research committees at the University of Alberta and University of Calgary, and the program director at the University of Saskatchewan approved this study.

Survey and validation

The survey was divided into 3 sections: demographic information, awareness of and exposure to GP surgery or ESS during training, and interest in pursuing formal ESS training. For this study, exposure to GP surgery was defined as having spent at least 1 week in medical training with a GP surgeon. Question formats included multiple choice, continuous measures using a sliding scale and free text. To assess respondents' awareness of the scope of practice within GP surgery, participants were given an extensive list of procedures and asked to select those that they believed are or should be performed by GP surgeons. This list ranged from common procedures well established within the scope of GP surgery and others less commonly performed or more heavily debated. Internal and external input to optimize survey quality (i.e., clarity, length, comprehensiveness) was received from ESS physicians, family physicians, family practice residents outside the study area and nonphysician volunteers before commencement of the study. A total of 19 people gave internal and external input to optimize survey quality. This led to subsequent amendments of survey content and wording. No similar survey could be found in the literature for reference.

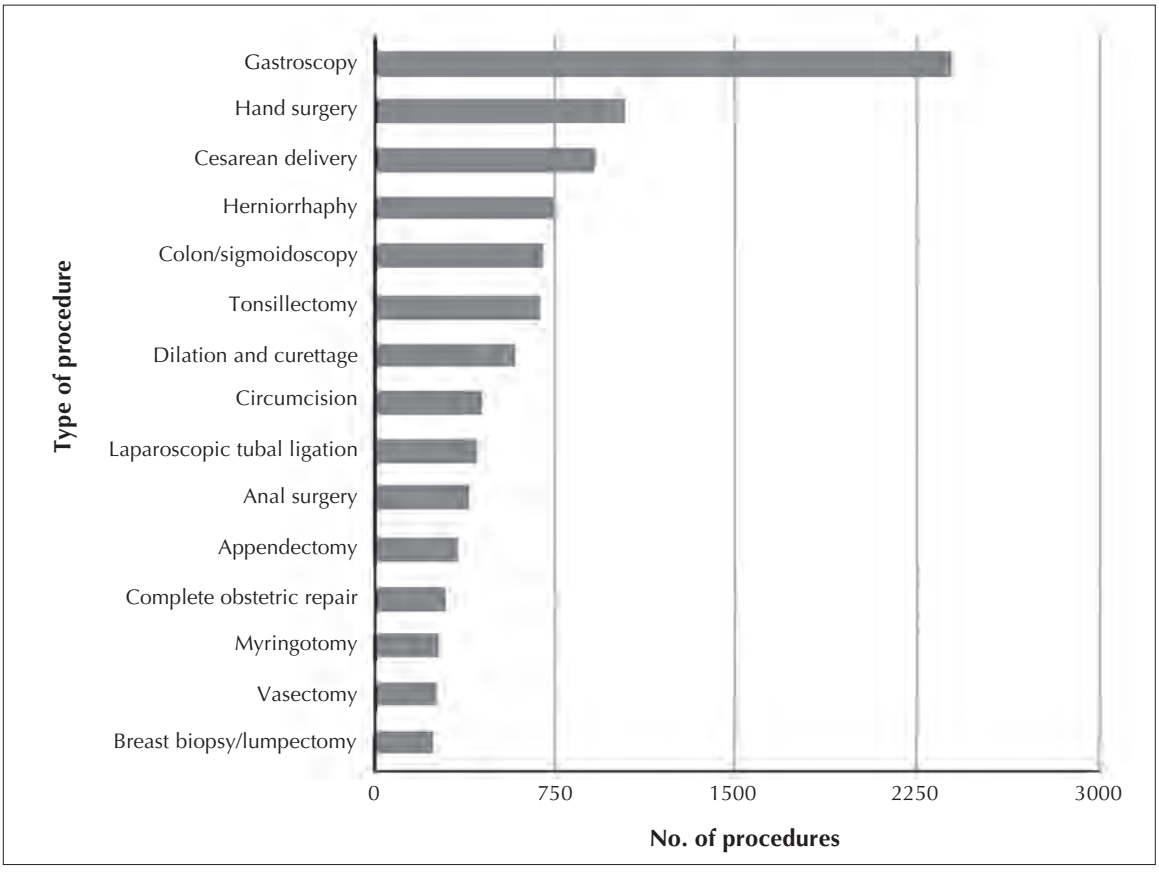


Fig. 1. Top 15 emergency and elective procedures performed by general practitioner surgeons in British Columbia. Adapted, with permission, from Humber and Frecker.[6]

Statistical analysis

We used frequency tables and χ^2 tests of independence for categorical data, and descriptive statistics (mean, median, standard deviation, confidence intervals) and 1-way analysis of variance for quantitative data. We constructed multiple-response frequency tables for "procedure list" data. Analysis was carried out with SPSS software, version 21. Because this was a descriptive study, power calculations were not required. We considered hypothesis test results statistically significant at the $p \leq 0.05$ significance level.

RESULTS

The survey was sent to 212 residents at the University of British Columbia, 161 residents at the University of Alberta, 186 residents at the University of Calgary and 79 residents at the University of Saskatchewan. We received 174 responses (response rate 27.2%). However, the sample size was sufficiently large to give margins of error of no more than 7.5% at the 95% confidence level. Because not all questions were answered in every survey, frequency distributions for each demographic characteristic were summarized with percentages based on the number of valid responses. Because the number of missing responses was low, the valid percentage was not meaningfully different from the percentage based on the overall denominator. Almost all of the respondents were either aged 20–30 years (114/174, 65.5%) or 30–40 years (50/174, 28.7%). A total of 112/173 (64.7%) respondents were women and 57/173 (32.9%) were men, and most were married or in a common-law relationship (105/174, 60.3%). Most respondents (139/173, 80.3%) were from nonrural hometowns and almost 20% (34/173, 19.7%) were from rural hometowns (rural defined by a population < 10 000). Of the participants, 75.3% (125/166) were training at urban residency sites, and 24.7% (41/166) were at rural sites. The response rate was slightly greater in the group training at rural residency sites (41/129, 31.8% v. 125/509, 24.6%). More participants were in their first postgraduate year than in their second year (95/173, 54.9% v. 78/173, 45.1%), with response rates of 29.8% (95/319) and 24.5% (78/319), respectively.

Awareness of GP surgery and ESS

About 10% of respondents were completely unaware of GP surgery (9.9% ± 4.5%), and even more respondents were unaware of the modern term ESS (17.9% ± 5.7%). Respondents from rural hometowns were significantly more aware of GP surgery and ESS than those from nonrural hometowns (GP surgery 100% v. 87.6%, respectively; $p = 0.03$; and ESS 94.1% v. 79.0%, respectively; $p = 0.04$). Respondents with prior exposure to GP surgery had significantly greater awareness of the role of GP surgeons than those without exposure. This difference was observed for awareness of GP surgery (96.9% v. 85.4%, respectively; $p = 0.02$) and ESS (95.4% v. 74.0%, respectively; $p = 0.001$). Although the university where respondents were completing their family practice residency was not related to awareness of GP surgery, 100% of respondents from the University of Saskatchewan were aware of ESS, which was significantly more than at other universities, where awareness ranged from 64.3% to 84.0% ($p = 0.01$). Respondents completing their family practice residency at a rural site had a greater awareness than their urban counterparts of both GP surgery (97.6% v. 87.8%) and ESS (90.0% v. 79.2%), although this difference was not statistically significant ($p = 0.07$). Interest in and awareness of ESS was related closely to exposure to the field during medical school and residency. One respondent commented that the field is "not promoted enough early on as a career option within family medicine," and another wrote, "there just isn't enough exposure."

Respondents' awareness of the scope of practice of GP surgeons varied (Fig. 2). For example, whereas 92.4% believed that GP surgeons perform cesarean deliveries, only 16.2% thought that GP surgeons perform bladder repairs after a bladder injury complication with cesarean delivery. In addition, 35.5% and 43.0% responded that laparotomies are and should be within the scope of a GP surgeon.

Exposure to GP surgery and ESS

A minority of respondents (38.2 ± 7.3%) had been exposed to GP surgery during training. In contrast, nearly three-quarters of participants from rural residency sites had trained with a GP surgeon, compared with one-quarter of those at urban sites (72.5% v. 26.8%; $p < 0.001$). Respondents in their second postgraduate year were more likely to have had exposure to GP surgery compared with those in their first postgraduate year (47.4% v. 31.2%; $p = 0.03$).

Of respondents with exposure to GP surgery, 29.9% had this experience only during medical school, 28.4% only during residency, and 31.3% in both medical school and residency. The remainder of respondents with experience in GP surgery had this exposure outside of formal medical training.

Most participants (68.4%) did not feel that their exposure to GP surgery during medical training was adequate. Urban residents were more likely than rural residents to describe their exposure as inadequate (78.9% v. 42.5%; $p < 0.001$). Services provided by GP surgeons and the importance of training opportunities in ESS were recognized. Respondents with prior ESS exposure and completing their residency at rural sites valued these opportunities more highly (Table 1). This positive opinion was also reflected in several comments: "GP obstetrics was my biggest exposure — great practitioners, crucial for rural communities," "GPs with enhanced surgical skills play a critical role to provide surgical care in rural areas in this country" and "I think GP surgeons are extremely important in rural areas. ... There should be more training programs."

Interest in ESS

Table 2 presents the career-related determinants of respondents' interest in pursuing ESS training, in rank order from highest to lowest scores. The most encouraging factors were given the highest scores with a maximum of 5.

In response to a binary yes-or-no survey question, one-quarter of respondents stated that they were considering ESS training (25.1% ± 6.4%). Those considering training were significantly more likely to be from rural residency sites than urban locations (37.5% v. 21.7%; $p = 0.05$). On a 100-point scale, with zero representing no interest at all and 100 representing a career goal, respondents were asked to rate their interest in ESS limited to obstetrics skills, and ESS with a broader, multidisciplinary spectrum

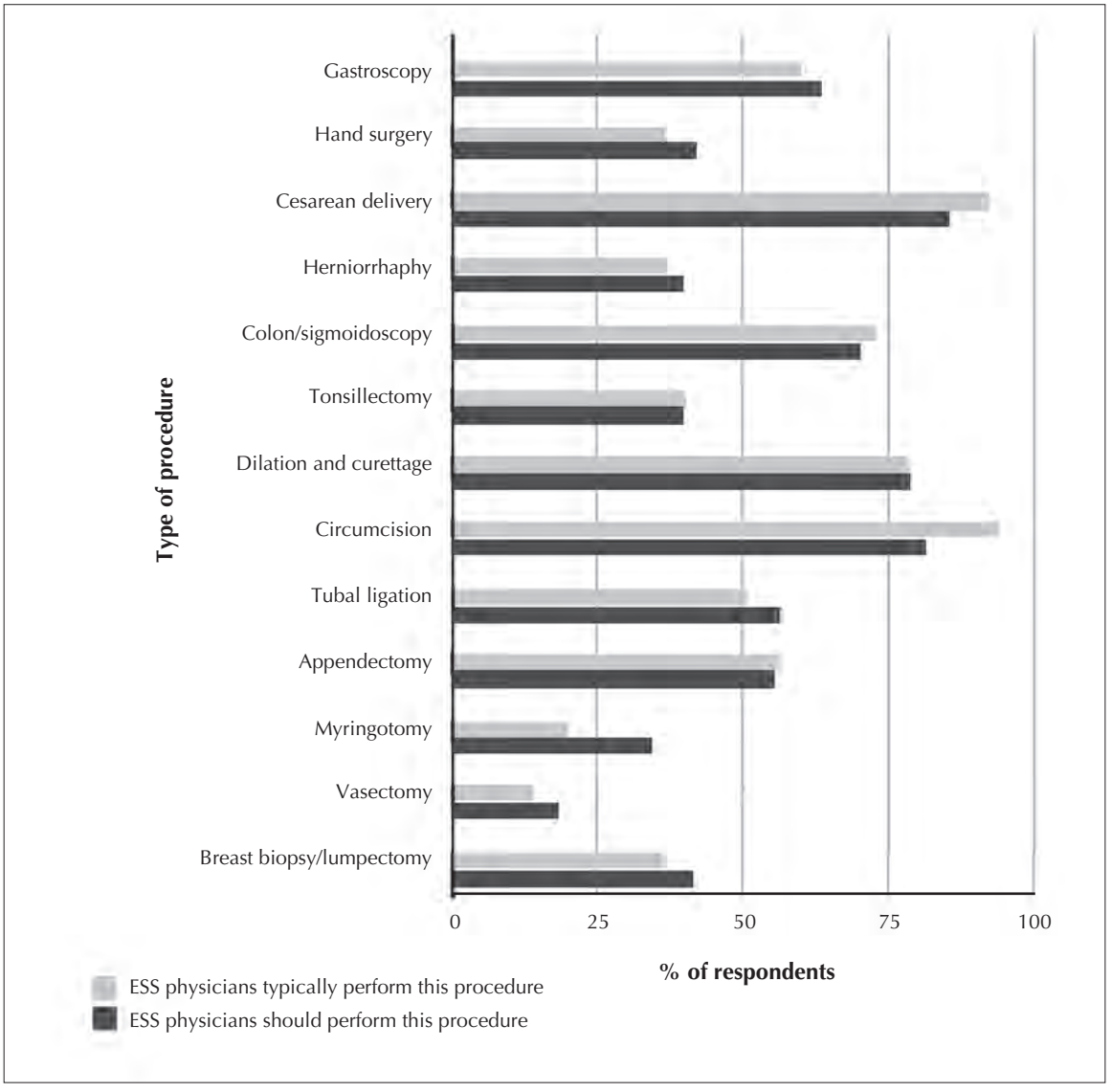


Fig. 2. Respondent beliefs about the top procedures currently performed by general practitioners with enhanced surgical skills (ESS).

Table 1. Factors relating to interest in enhanced surgical skills training (obstetrics only and broad-spectrum practice) and perspectives about the importance of enhanced surgical skills among family practice residents in western Canada

Variable	Mean score ± SD			
	Interest in ESS (obstetrics only)*	Interest in ESS (full spectrum)*	Importance of ESS training in western Canada†	Importance of ESS service in western Canada†
All respondents	36.7 ± 33.1	31.5 ± 31.1	68.6 ± 28.8	80.1 ± 22.4
Hometown population				
< 10 000	41.5 ± 30.4	39.7 ± 32.0	76.4 ± 25.5	87.5 ± 21.1‡
≥ 10 000	35.3 ± 33.4	29.7 ± 30.8	66.5 ± 29.5	78.1 ± 22.4‡
Residency site				
Urban	31.6 ± 33.0‡	26.5 ± 29.6‡	64.6 ± 30.0‡	77.5 ± 23.5‡
Rural	51.3 ± 30.1‡	46.7 ± 31.6‡	82.1 ± 21.1‡	89.6 ± 13.8‡
Previous training with GP surgeon				
Yes	49.3 ± 31.7‡	41.1 ± 32.3‡	80.3 ± 22.0‡	90.3 ± 13.3‡
No	28.8 ± 31.7‡	25.6 ± 28.9‡	61.4 ± 30.2‡	73.9 ± 24.5‡

ESS = enhanced surgical skills; GP = general practitioner; SD = standard deviation.
*Respondents were asked to rank interest on a scale of 0 to 100, with 0 meaning "no interest" and 100 meaning "very interested; a career goal."
†Respondents were asked to rank importance on a scale of 0 to 100, with 0 meaning "not important" and 100 meaning "very important."
‡$p \leq 0.05$.

Table 2. Ranking of factors affecting interest in pursuing enhanced surgical skills training*

Rank	Factor	Mean score ± SD
1	Increased procedures	4.13 ± 0.80
2	Increased scope of practice	3.99 ± 0.84
3	Impact on patient outcomes	3.94 ± 0.85
4	Challenging/acute medicine	3.85 ± 0.89
5	Provision of surgical services to community	3.83 ± 0.92
6	Remuneration	3.50 ± 0.73
7	Portability of skill set	3.49 ± 1.02
8	Previous experience with a GP surgeon	3.49 ± 0.77
9	Working in a rural and remote community	3.47 ± 1.14
10	CME opportunities	3.28 ± 0.77
11	Support from specialists	3.25 ± 0.99
12	Adequacy of training	3.22 ± 0.90
13	Level of confidence in scope of practice	3.12 ± 1.09
14	Ease of licensing	3.08 ± 0.95
15	Current training opportunities available	3.05 ± 0.91
16	Length of training required	2.98 ± 0.90
17	Opportunities for research	2.64 ± 0.98
18	Medicolegal implications	2.62 ± 1.00
19	Call schedule	2.47 ± 1.05

CME = continuing medical education; GP = general practitioner; SD = standard deviation.
*Variables rated on a 5-point scale: 1 = strongly discourage, 2 = discourage, 3 = neutral, 4 = encourage and 5 = strongly encourage.

of surgical procedures. Interest in the former was significantly higher than the broader spectrum ESS (mean score 36.7 v. 31.5, $p = 0.02$). Interest in ESS (both obstetrics only and the broader spectrum) was significantly impacted by type of residency site (urban v. rural) and exposure to GP surgery during training (Table 1).

Respondents ranked importance of availability of ESS training and ESS services to rural Canadians. On a 100-point scale, the mean value placed on importance of ESS training opportunities was 68.6 (95% CI 64.2–73.0) and the mean value for importance of the service provided by family physicians with ESS was 80.1 (95% CI 76.6–83.6). Factors having an impact on these scores included town of origin (rural v. nonrural), residency site (rural v. urban) and exposure to GP surgery during training (Table 1). The recognized crisis in rural surgery and the lack of training opportunities was confusing to potential learners. One respondent commented, "there is little information provided on the availability of this option for GPs and it is difficult to know where to look."

Finally, one respondent noted the potential negative impact of faculty members in larger centres: "I very much would like to explore surgical skills. It is hard to do this when you are only exposed to specialists that tell you that you can't do these procedures safely. ... It would be really nice and motivating to spend more time with GP surgeons." Another respondent echoed concerns regarding urban training: "I never saw anything but the complications sent in to major centres."

DISCUSSION

The need for formal programs in Canada for standardized ESS training is apparent. Ongoing attrition of small surgical programs compounds barriers in access to health care for Canada's rural population. As efforts are currently afoot to develop ESS training, it is important to consider the background, training pathways and perspectives of potential recruits. These include family practice residents who will be at the core of Canada's future rural health care.

Although most respondents were aware of GP surgery, a notable number of respondents were unaware that this career option exists within their field. Even more respondents were unfamiliar with ESS, likely reflecting the relative infancy of this terminology. Not surprisingly, awareness of this latter term was greater at the University of Saskatchewan, which houses the country's only active ESS training program.

Awareness of GP surgeons' scope of practice was limited. There is discordance between the documented scope of GP surgery presented by Humber and Frecker[6] (Fig. 1) and our respondent's perceptions (Fig. 2). Also of interest is the high proportion of respondents who thought laparotomies are, or should be, performed by GP surgeons. This is an uncommon procedure within the realm of GP surgery. Such perspectives may result from low exposure to GP surgery during training with limited awareness of the scope of practice. Alternatively, some respondents may truly believe laparotomies ought to be within the scope of ESS.

Of importance, for most procedures outlined, the proportion of respondents who believed that GP surgeons should perform a given procedure was greater than the proportion of those who believed that GP surgeons do perform that procedure (Fig. 2). This pattern may indicate that the participating family practice residents believe GP surgeons should be doing more surgical procedures and expanding their scope of practice.

Awareness and interest in ESS were closely related to exposure to the field during medical school and residency. This suggests that the career path residents ultimately choose is influenced not only by community of origin, but also by clinical experiences during training. This underscores the importance of ESS training opportunities in medical curricula, particularly for urban residents who felt they were lacking. Respondents specifically expressed that ESS was not promoted enough as a career option and that there was not enough exposure during their medical training. The data reflects this, with only 38.2% of respondents being exposed to GP surgery or ESS in their training to date. If the exposure occurred, 28.4% of respondents did not have their first experience until their family practice residency, and 16.2% were not exposed to this role in their profession until their final year of residency. Earlier exposure may inspire medical trainees toward a career in ESS that they otherwise would not have considered.

The potential impact of faculty members in larger centres should be considered. Urban specialists who imply that GP surgeons are unsafe may have a negative impact on trainees who wish to pursue ESS. Furthermore, urban respondents felt that they saw a misrepresentation of GP surgery cases, being exposed only to those patients who had complications requiring transfer to larger centres. These respondents expressed interest in training in smaller hospitals with GP surgeons.

The surprisingly large percentage (25.1%) of respondents reporting interest in pursuing ESS

training was encouraging. Interest was particularly strong among respondents with prior exposure to GP surgery, and among those at rural residency sites. Although the mean scores ranged from 31 to 36 on a 100-point scale, the largest standard deviations for interest in these groups exceeded 80 (Table 1). This wide range of interest likely reflects the demographic diversity of the survey participants. Respondents were particularly encouraged to pursue ESS by the acquisition of technical skills it offers and the opportunity to address a social need (Table 2).

The acknowledged crisis in rural surgery and demonstrated interest in ESS training contrasts sharply with the paucity of training opportunities currently available. This is confusing for potential trainees who may feel that there is little information readily available on ESS opportunities.

Confusion may also stem from the diverse training pathways to GP surgery in Canada. Although many trained domestically, a large number of Canada's GP surgeons are international medical graduates.[8] Due to the inconsistent availability of formal Canadian curricula, many GP surgeons have trained through self-directed programs based on personal initiative. The lack of formal training and absence of certification in Canada has caused challenges with credentialing and portability of skills.[8] Not surprisingly, respondents ranked "ease of licensing" and "current training opportunities" near the bottom of the list of factors encouraging them to pursue ESS training (Table 2), which may be interpreted as a top reason why some choose not to pursue ESS.

The importance of training opportunities in ESS and the services provided by GP surgeons were recognized. Those at rural sites and with prior exposure to GP surgery valued these more highly, emphasizing the benefit of rural exposure during training (Table 1). The positive opinion that many held regarding GP surgery was also reflected in several respondent comments that physicians with ESS training play a critical role in rural communities.

Limitations

The lower-than-expected response rate may have been related to the timing of the survey, which coincided with the College of Family Physicians of Canada's examination, and was reflected in a lower response rate for the residents in their second (final) postgraduate year. The timing at the end of the residency year, however, permitted a more accurate reflection of exposure and perspectives gained from the entire 2-year residency because respondents had nearly completed their first and second years. Response rates for multiple demographic categories (e.g., age, sex, marital status and hometown size) could not be calculated because of provincial privacy and personal information laws that precluded administrative departments of participating universities from releasing these data. Comparison of this demographic data was therefore not possible. With the low response rate likely attributable to survey timing, the risk of nonresponse bias is low.

Although we considered a potential nonresponse bias due to a higher response from family practice residents from rural communities or in rural programs, this does not appear to be the case. For example, more than 80% of respondents were from hometowns with a population greater than 10 000, which is similar to Canada's population demographics (> 70% of Canadians reside in nonrural communities). In addition, more than 75% of participants were from urban residency sites, which approximates the underlying residency statistics of 80% urban programs and 20% rural. We suspect the skewed male:female ratio may reflect the recent trend toward a higher proportion of female family practice residents. However, this cannot be confirmed because privacy laws prevented acquisition of the necessary demographics to test the theory.

The 25% of respondents who expressed interest in ESS training was unexpected. There is a limited role for potential nonresponse bias in this documented level of interest, as discussed above. This interest does not coincide with the number of positions available for ESS training in Canada, nor the number of yearly applications the sole formal ESS program receives (Dr. Aimee Seguin, University of Saskatchewan, Saskatoon, Sask.: personal communication, 2014). A number of factors may contribute to this discrepancy. Unlike most other residency programs in the country, such as the Canadian College of Family Physicians — Emergency Medicine (CCFP[EM]) program, applications for ESS are currently made informally or directly to each institution, rather than through the national Canadian Resident Matching Service (CaRMS). Absence of this formal posting may decrease awareness of program existence and content, and decrease confidence in program quality. Information about the ESS program is available only on individual university websites, and this material can be sparse or difficult to locate.

Finally, the interest level seen in ESS training does not necessarily imply commitment to pursuing

this training, nor to a career in rural and remote communities. However, such strong support of ESS from future family physicians is a critical finding. Reasons for the difference between interest in ESS and actual rates of program application were beyond the scope of our study. This remains an important topic for future study.

Although valuable in obtaining perspectives of one potential user group of ESS training programs (family practice residents from the 4 participating universities in western Canada), this study was not exhaustive. Future studies may focus on perspectives of other potential ESS trainees including medical students, current family physicians in Canada, other family practice residents in Canada and international medical graduates. Obtaining the perspectives of specialists who play significant teaching and mentoring roles for ESS trainees would also provide valuable input. This study is an important step in optimizing the opportunity for potential trainees and educators to have input into a formal ESS training program.

CONCLUSION

General practitioner surgery and ESS play an important role for providing rural surgical care in western Canada. Given that it is a career option for family practice residents, a notable proportion were unaware of the concept of ESS. Residents from rural hometowns and those who had exposure to GP surgery or ESS during training were significantly more aware of these concepts. Furthermore, exposure to GP surgery and training at a rural residency site both appeared to foster interest in this field. When one considers the need for more rural family physicians and the protection of rural surgical services, the importance of increasing ESS training opportunities becomes apparent. Future research with additional stakeholder groups will assist ongoing efforts in improving surgical care for rural Canadians.

Competing interests: None declared.

Funding: The National Working Group on Enhanced Surgical Skills provided funding for this study.

REFERENCES

1. Bollman RD, Clemenson HA. *Structure and change in Canada's rural demography: an update to 2006 with provincial detail*. Ottawa (ON): Statistics Canada, Agriculture Division; 2008.
2. *Census Directory. Census metropolitan area (CMA) and census agglomeration (CA)*. Ottawa (ON): Statistics Canada; 2012. p. 90.
3. *Supply, distribution and migration of Canadian physicians, 2011*. Ottawa (ON): Canadian Institute for Health Information; 2012.
4. Iglesias S, Tepper J, Ellehoj E, et al. Rural surgical services in two Canadian provinces. *Can J Rural Med* 2006;11:207-17.
5. Chiasson PM, Roy P. Role of the general practitioners in the delivery of surgical and anesthesia services in rural western Canada. *CMAJ* 1995;153:1447-52.
6. Humber N, Frecker T. Rural surgery in British Columbia: Is anybody out there? *Can J Surg* 2008;51:179-84.
7. Iglesias S, Jones L. Rural surgery programs in western Canada. *Can J Rural Med* 2002;7:103-7.
8. Kornelsen J, Iglesias S, Humber N, et al. GP surgeons' experiences of training in British Columbia and Alberta: a case study of enhanced skills for rural primary care providers. *Can Med Educ J* 2012;3:e33-41.
9. Humber N, Dickinson P. Rural patients' experiences accessing surgery in British Columbia. *Can J Surg* 2010;53:373-8.
10. 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.
11. Deutchman M, Connor P, Gobbo R, et al. Outcomes of caesarean sections performed by family physicians and the training they received. *J Am Board Fam Pract* 1995;8:81-90.
12. Black DP, Fyfe IM. The safety of obstetric services in small communities in northern Ontario. *Can Med Assoc J* 1984;130:571-6.
13. Rodney WM, Hocutt JE Jr, Coleman WH, et al. Esophagogastroduodenoscopy by family physicians: a national multisite study of 717 procedures. *J Am Board Fam Pract* 1990;3:73-9.
14. Harper MB, Pope JB, Mayeaux EJ Jr, et al. Colonoscopy experience at a family practice residency: a comparison to gastroenterology and general surgery services. *Fam Med* 1997;29:575-9.
15. Caron NR, Lewis-Watts DA, Webber EM. Provision of emergency surgical services in isolated communities. *Can J Surg* 1998;41(Supp):8.
16. Woollard R, chair. National Working Group on Enhanced Surgical Skills Meeting, Victoria (BC). 2013 Apr. 6.
17. Iglesias S, Caron NR, co-chairs. Centre for Rural Health Research, ed. *Proceedings from the Invitational Meeting on Rural Surgical Services*. Vancouver (BC): Centre for Rural Health Research; 2007.

Service Information

Society of Rural Physicians of Canada (SRPC) members: Subscription price included in membership fee.

Nonmembers (2015 rates): *Individuals:* Canada, $132 (single copy, $25); United States and elsewhere, US$168 (single copy, US$25). *Institutions:* Canada, $210 (single copy, $25); United States and elsewhere, US$273 (single copy, US$25). *Students/residents:* $42 Can/US$. These rates include surface postage. Canadian subscribers please add applicable taxes.

All subscriptions are payable in advance. Payment should be made to the Canadian Medical Association (CMA) in the funds specified. MasterCard, VISA and American Express are accepted. Orders or requests for information should be addressed to *CJRM*, Canadian Medical Association Subscription Office, PO Box 830350, Birmingham AL 35283-0350; 800 633-4931 (Canada/US) or 205 995-1567; fax 205 995-1588; cma@subscriptionoffice.com.

Missing issues: Claims for missing issues must be made within 3 months of publication date (subject to availability).

Change of address: Send one month before effective date to the CMA Member Service Centre (see above).

Reprints: Commercial and author reprints can be purchased through our partner Sheridan Press. To purchase commercial article reprints and ePrints, or to request a quote, please contact Matt Neiderer, Content Sales, Sheridan Content Services; 800 635-7181 x8265; matt.neiderer@sheridan.com. Authors can order their reprints by submitting an author reprint order form available at the Sheridan Press Electronic Order Centre at www.sheridan.com/cma/eoc or by contacting Lori Laughman, Customer Service Representative, Sheridan Reprints Services; lori.laughman@sheridan.com.

Copyright and Permissions: Copyright for all material is held by the SRPC or its licensors, unless otherwise indicated. You may reproduce or otherwise use material from this journal only in accordance with Canadian copyright law and provided that credit is given to the original source. In the case of photocopying or other reprographic copying, please contact the Canadian Copyright Licensing Agency (Access Copyright): 800 893-5777; accesscopyright.ca.

Indexing and Abstracting: *CJRM* is available through the following services: MEDLINE/*Index Medicus*, Ovid Technologies, EbscoHost EJS, ProQuest Information and Learning Company, CAB Abstracts, Global Health and *Ulrich's International Periodicals Directory*. All articles published in *CJRM* are available free at the time of publication at srpc.ca.

RuralMed: Information on RuralMed (the SRPC listserv) is available online at srpc.ca.

Advertising: *Classified ads:* Contact Journal Advertising, *CJRM*, 1867 Alta Vista Dr., Ottawa ON K1G 5W8; 800 663-7336 or 613 731-8610 x2107/2041; fax 613 565-7488; advertising@cma.ca. See Classified Advertising section of *CJRM* for information on rates. *Display ads:* Contact Journal Advertising (see preceding information), x2159.

RuralMed: the SRPC listserv
MedRurale : la liste de diffusion de la SMRC

RuralMed

Subscription to RuralMed is by request. Send an email message to: **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 **srpc.ca**.

MedRurale

Pour vous abonner au serveur de liste francophone, MedRurale, veuillez envoyer un courriel à l'adresse suivante : **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, **srpc.ca**.

Original Article
Article original

The economic contribution of the Northern Ontario School of Medicine to communities participating in distributed medical education

John C. Hogenbirk, MSc
Centre for Rural and Northern Health Research, Laurentian University, Sudbury, Ont.

David R. Robinson, PhD
Department of Economics, Laurentian University, Sudbury, Ont.

Mary Ellen Hill, PhD
Centre for Rural and Northern Health Research, Lakehead University, Thunder Bay, Ont.

Raymond W. Pong, PhD
Centre for Rural and Northern Health Research, Laurentian University, Sudbury, Ont.

Bruce Minore, PhD
Centre for Rural and Northern Health Research, Lakehead University, Thunder Bay, Ont.

Ken Adams, MHSA
Northern Ontario School of Medicine, Lakehead University, Thunder Bay, Ont.

Roger P.Strasser, MBBS, MClSc, FRACGP, FACRRM
Northern Ontario School of Medicine, Laurentian University, Sudbury, Ont.

Joe Lipinski, CPA, CA
Northern Ontario School of Medicine, Lakehead University, Thunder Bay, Ont.

Correspondence to:
John Hogenbirk;
jhogenbirk@laurentian.ca

This article has been peer reviewed.

Introduction: The economic contribution of medical schools to major urban centres can be substantial, but there is little information on the contribution to the economy of participating communities made by schools that provide education and training away from major cities and academic health science centres. We sought to assess the economic contribution of the Northern Ontario School of Medicine (NOSM) to northern Ontario communities participating in NOSM's distributed medical education programs.
Methods: We developed a local economic model and used actual expenditures from 2007/08 to assess the economic contribution of NOSM to communities in northern Ontario. We also estimated the economic contribution of medical students or residents participating in different programs in communities away from the university campuses. To explore broader economic effects, we conducted semistructured interviews with leaders in education, health care and politics in northern Ontario.
Results: The total economic contribution to northern Ontario was $67.1 million based on $36.3 million in spending by NOSM and $1.0 million spent by students. Economic contributions were greatest in the university campus cities of Thunder Bay ($26.7 million) and Sudbury ($30.4 million), and $0.8–$1.2 million accrued to the next 3 largest population centres. Communities might realize an economic contribution of $7300–$103 900 per pair of medical learners per placement. Several of the 59 interviewees remarked that the dollar amount could be small to moderate but had broader economic implications.
Conclusion: Distributed medical education at the NOSM resulted in a substantial economic contribution to participating communities.

Introduction : Les écoles de médecine peuvent apporter des avantages économiques importants aux grands centres urbains. On n'en sait guère toutefois sur l'apport économique, pour les communautés participantes, des écoles qui offrent des cours et de la formation hors des grandes villes et loin des centres universitaires des sciences de la santé. Nous avons voulu évaluer la contribution économique de l'École de médecine du Nord de l'Ontario (EMNO) aux communautés qui participent à ses programmes d'apprentissage distribué.
Méthodes : Nous avons créé un modèle économique local et utilisé les dépenses réelles de 2007/08 pour évaluer l'apport économique de l'EMNO aux communautés du Nord de l'Ontario. Nous avons aussi estimé l'apport économique des étudiants en médecine ou des médecins résidents qui participent aux divers programmes offerts dans les communautés éloignées des campus de l'université. Enfin, pour explorer les répercussions économiques plus vastes, nous avons effectué des entrevues semi-structurées auprès de chefs de file des milieux de l'éducation, des soins de santé et de la politique dans le Nord de l'Ontario.
Résultats : L'apport économique total de l'EMNO s'est chiffré à 67,1 millions de dollars (dépenses de l'École, 36,3 millions; dépenses des étudiants, 1,0 million). L'apport économique a été le plus important pour les villes qui hébergent un campus de l'université, soit Thunder Bay (26,7 millions) et Sudbury (30,4 millions), les 3 centres

suivants en importance bénéficiant d'un apport de 0,8 à 1,2 million de dollars. Les communautés peuvent réaliser des bénéfices économiques de 7 300 $ à 103 900 $ par paire d'apprenants en médecine par placement. Plusieurs des 59 personnes interviewées ont souligné que le montant des contributions, en argent, peut être assez petit ou moyen, mais que les répercussions économiques se font sentir à plus grande échelle.

Conclusion : L'éducation médicale distribuée à l'EMNO a apporté une contribution économique substantielle aux communautés participantes.

INTRODUCTION

The economic contribution of medical schools can be considerable. However, little information exists on the contribution to host cities; most assessments estimate contribution at the state or provincial level. For example, the Faculty of Medicine and Dentistry at the University of Alberta contributed an estimated $1.2 billion to the province of Alberta in 2011/12.[1] In 2013, the economic contribution to Canada of Canadian medical schools and affiliated teaching hospitals was estimated at $66.1 billion.[2]

Studies on Canadian universities (with or without medical schools) have estimated the economic contribution to the university campus cities,[3] and the contribution to satellite campuses is anticipated, though not yet demonstrated.[4] Schools that provide distributed medical education programs (i.e., education and training away from urban areas and academic health science centres) can expect to make an economic contribution in multiple communities.[5,6] For example, Montana's component of the Washington, Wyoming, Alaska, Montana and Idaho (WWAMI) medical education program contributed an estimated US$18 million to the state in 2010, of which US$2.9 million went to state-wide clinical teaching sites.[7]

The Northern Ontario School of Medicine (NOSM), which started training medical students in 2005, was established with a social accountability mandate to help improve the health of the people of northern Ontario.[8] With a population of 803 866 distributed over 802 725 km^2, northern Ontario has 6% of Ontario's population and 90% of its land base.[9] Northern Ontario, relative to the province, has a higher proportion of Aboriginal (14% v. 2%) and francophone (24% v. 5%) people.[10,11] Northern Ontario's economy is largely resource-based, and the population has lower socioeconomic characteristics and worse health status than the rest of the province.[12] Many parts of northern Ontario have chronic shortages of doctors and other health professionals.[13]

The Northern Ontario School of Medicine has campuses at Lakehead University in Thunder Bay (population 120 000) and Laurentian University in Sudbury (population 160 000), which are 1000 km apart by road. Developed through a community consultative process, the NOSM medical degree curriculum is grounded in the health context of northern Ontario, organized around 5 themes (northern and rural health, personal and professional aspects of medical practice, social and population health, foundations of medicine, and clinical skills)[8] and uses electronic communications and community partnerships to support NOSM's model of distributed, community-engaged learning. There is an emphasis on interprofessional education and integrated clinical learning that takes place in more than 70 communities and many different health service settings,[14] so that students personally experience a diversity of communities and cultures.[8] In the third year, all students undertake a longitudinal integrated clerkship based in family practice. Third-year students achieve learning objectives that cover the same 6 core clinical disciplines as in the traditional clerkship blocks (surgery, internal medicine, children's health, women's health, mental health and family medicine [plus emergency medicine]) while living in one of a dozen or so large rural or small urban communities in northern Ontario, away from the university campuses.

Learners, educators and support personnel stay in northern Ontario communities from 4 to 30 weeks per year, and their spending, as well as NOSM spending, contributes to the local economy. Communities host NOSM workshops, conferences and committee meetings, which inject dollars into the local economy and may have additional benefits.

Previous work examined the overall socioeconomic contribution of NOSM to northern Ontario.[15] This paper takes a detailed look at NOSM's economic contribution in northern Ontario communities according to the number and type of educational programs as well as population size.

METHODS

Contribution based on actual spending

We developed a local economic model founded on economic base theory[16–19] to estimate the economic contribution of NOSM to northern Ontario communities. We estimated economic contribution, as defined by Watson and colleagues[17] as total dollars attributed to all current economic activity associated with NOSM. An estimate of total economic activity was appropriate because NOSM created new programs, such as the undergraduate medical education program, and redeveloped existing programs, such as postgraduate medical education programs formerly administered by the Northeastern Ontario Medical Education Corporation and the Northwestern Ontario Medical Program.

Salaries and benefits, spending on travel, supplies and services, stipends paid to preceptors, spending by learners and research expenditures were included. We excluded costs of construction and renovations so that we could estimate the ongoing impact rather than the one-time start-up impact. Visitor spending was excluded because we reasoned that NOSM would attract only a few visitors to northern Ontario. Other travel spending was already included. Spending by host universities of Lakehead and Laurentian were excluded because these monies do not flow through the medical school.

Spending location was based on the mailing address of the employee or vendor. To estimate spending within communities, we acquired NOSM expenditure data for fiscal year 2007/08 and program participation data for fiscal year 2007/08 to fiscal year 2009/10 for 128 geographic place names in northern Ontario. These place names were matched to 100 census subdivisions, which are equivalent to municipalities,[20,21] and for which we obtained 2006 population estimates. Economic contributions were calculated for all census subdivisions, but we focused on those that had expenditure and program data.

We estimated direct economic effects[19] from labour expenditures. Indirect economic effects were estimated as the spending and re-spending in the area by NOSM's suppliers. Monies that left the area (i.e., leakage) were not available to be re-spent and so spending in each round diminished, with the cumulative amount estimated by the economic multiplier. Induced economic effects were estimated as spending by people employed by NOSM or NOSM's suppliers and subsequent re-spending in the area, with corrections for leakage.

The total economic contribution comprised direct, indirect and induced contributions,[19] and was estimated with multipliers calculated from a population-sensitive equation developed for all communities in Ontario and used previously to estimate the economic contribution of health care facilities in Sudbury.[22] Multipliers were similar to those used in other studies of economic contribution in Ontario[22–24] and were built on a minimum requirements approach.[18,19]

Contribution based on estimated spending

We developed program-specific estimates for expenses, such as housing, food and incidentals, preceptor stipends/honoraria and administrative support, to estimate the economic contribution of medical learners as they spend time in northern Ontario communities, away from the university campuses. We calculated the impact for each of the 4 undergraduate years and a typical postgraduate placement, thereby allowing a community to estimate an economic contribution based on program(s) (e.g., undergraduate year 1, postgraduate year 1) in a given year.

The Northern Ontario School of Medicine places pairs of learners in each community, and the models reflect this arrangement. We estimated the percentage of local spending to adjust for leakage. For example, rent may be paid to landlords who reside in other communities. We assumed a minimum of 40% local spending in the smaller communities and typically 80% in the larger communities. The school's spending and portion of total spending varied by program type and location.

To explore the broader economic effects, we conducted semistructured interviews with leaders in education, health care and politics from northern Ontario communities. Potential interviewees were selected as those who would be aware of the impact that NOSM has on northern Ontario, ensuring that a range of occupations and roles were represented and that a number of communities were chosen to maximize diversity of opinion. Interviews, conducted in 2008/09, were transcribed with the permission of interviewees. Transcripts were searched for comments on the positive or negative economic effect of NOSM. Social impacts were described in a previous report.[15]

The Research Ethics Boards of Lakehead and Laurentian Universities gave ethical approval for this study.

RESULTS

Economic contribution

We estimated the economic contribution to 62 communities in northern Ontario and conducted semi-structured interviews with 59 leaders in education, health care and politics from 20 communities in northern Ontario. In 2007/08, NOSM had expenditures of $38.2 million, of which $36.3 million (95%) was spent in northern Ontario.[15] We estimated that medical students at NOSM spent an additional $1.0 million in northern Ontario. The total economic contribution of NOSM in 2007/08 to northern Ontario was estimated at $67.1 million. Economic contribution was greatest in Sudbury ($30.4 million) and Thunder Bay ($26.7 million), where the university campuses are located (Table 1). An annual estimated economic contribution of $10.0 million was spread throughout the rest of northern Ontario, of which $0.8–$1.2 million accrued to the 3 next largest population centres.

In general, the number of educational programs, NOSM expenditure and contribution all increased with increasing size of the community population (Fig. 1). One community with a population of just over 5000 had total spending in excess of $200 000, placing it above the general trend. This community serves as a major health care referral centre for many smaller communities, and this greater activity was reflected in higher spending.

Using built-up estimates of spending by NOSM and learners, we estimated an economic contribution ranging from $7300 to $103 900 per pair of learners per placement (Table 2). The 30-week Comprehensive Community Clerkship resulted in the largest economic contribution per placement. Multiple placements are possible for other program years and the total annual economic contribution in a community would be higher.

Broader economic effects

Several interviewees remarked that the economic contribution in small communities and midsized cities could be small to moderate in terms of actual dollars, but had broader economic implications. Most interviewees expressed tempered optimism that training medical learners in these northern communities would improve recruitment and retention of physicians and other health care providers. Some early anecdotal evidence from the media and comments from colleagues suggests that a few of the clinical teachers had come to the community specifically to teach and a few learners who had trained in the community had returned there to practise.

Several interviewees noted that adding a physician or other professional to a community brought new

Table 1. Total spending, economic contribution and participation in selected programs at the Northern Ontario School of Medicine in fiscal year 2007/08 in the 5 largest cities in northern Ontario

Variable	Timmins	North Bay	Sault Ste. Marie	Thunder Bay	Sudbury
2006 census population	42 997	63 424	80 098	122 907	158 258
Total spending, $*	541 000	608 000	724 000	15 528 000	16 981 000
Multiplier†	1.45	1.54	1.60	1.72	1.79
Economic contribution, $*	784 000	935 000	1 157 000	26 710 000	30 395 000
Comprehensive Community Clerkship	Yes	Yes	Yes	—	—
Specialty training from the CFPC‡	Yes	Yes	Yes	Yes	Yes
Specialty training from the RCPSC	Yes	Yes	Yes	Yes	Yes
Rehabilitation Studies program‡	Yes	Yes	Yes	Yes	Yes
Northern Ontario Dietetic Internship Program‡	Yes	—	Yes	Yes	Yes

CFPC = College of Family Physicians of Canada; RCPSC = Royal College of Physicians and Surgeons of Canada.
*All dollar values were rounded to the nearest thousand.
†Multipliers derived from population size using the formula by McCracken et al.[22]
‡Sites where these programs were offered in 2009/10, which may differ from 2007/08.

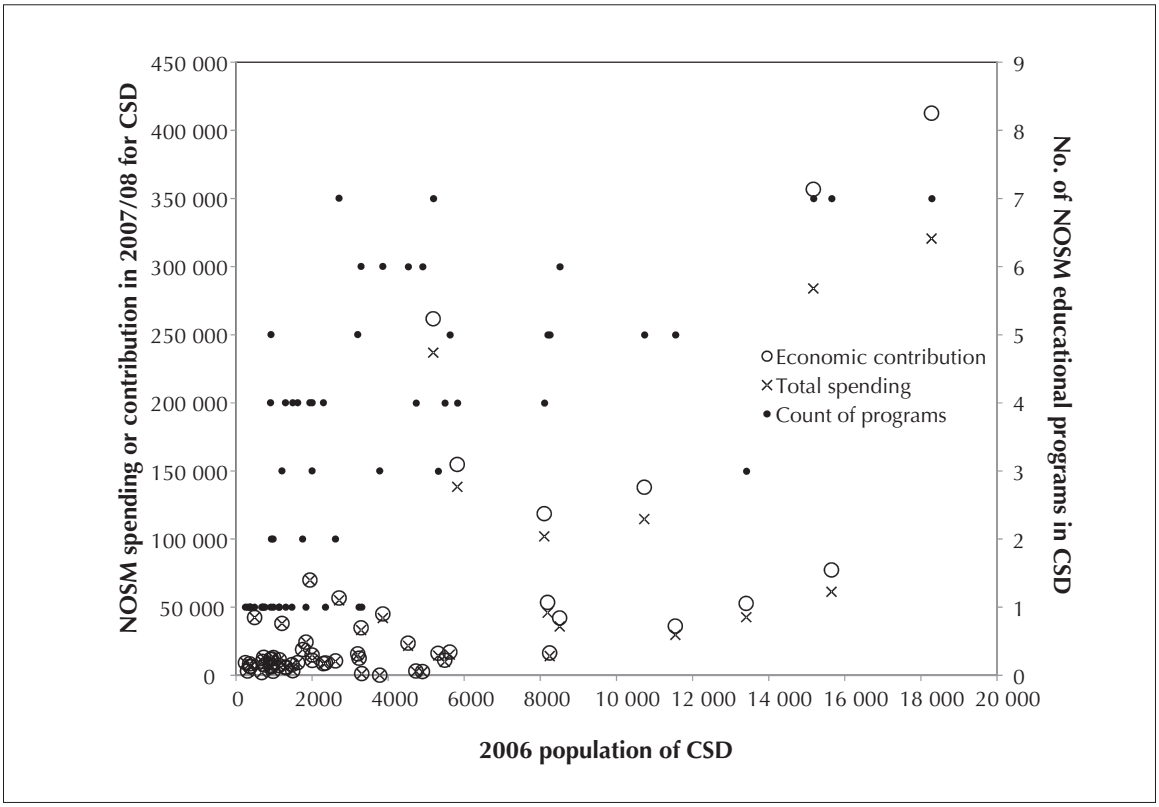


Fig. 1. Total spending, estimated economic contribution and number of educational programs of the Northern Ontario School of Medicine (NOSM) in fiscal year 2007/08 for 57 census subdivisions (CSDs) in northern Ontario. (Five CSDs with a population > 40 000 and spending > $400 000 were excluded to improve resolution at lower population size.)

Table 2. Estimated economic contribution to northern Ontario communities of 2 undergraduate medical students in years 1–4 and 2 postgraduate residents*†

Variable	UGY1 students	UGY2 students	UGY3 students	UGY4 students	Postgraduate residents
Course description	Two first-year undergraduate students spend 4 wk in an Aboriginal community in northern Ontario	Two second-year students complete two 4-wk placements in small rural/remote northern Ontario communities	Two third-year students spend 30 wk completing the CCC in a host community in northern Ontario§	Two fourth-year students spend a 4-wk elective in a larger community¶	Clinical learning placements for 2 residents occur in northern Ontario communities for an average of 8 wk¶
Learner spending, $	400	6 200	7 200	3 100	6 200
NOSM spending, $	10 400	6 100	68 200	2 200	4 400
Total local spending, $	10 800	12 300	75 400	5 300	10 600
Community population size	2 500 (assumed)	2 500 (assumed)	30 300 (average of 10 CCC sites: range 5 200–80 100)	30 300 (assumed equal to CCC sites)	30 300 (assumed equal to CCC sites)
Estimated economic contribution, $‡	11 000	12 500	103 900	7 300	14 600

CCC = Comprehensive Community Clerkship; NOSM = Northern Ontario School of Medicine; UGY = undergraduate year.
*Excludes economic contribution to Sudbury and Thunder Bay.
†All dollar values were rounded to the nearest hundred.
‡Based on multipliers derived from population size using the formula by McCracken et al.[22]
§In 2007/08, there were 10 CCC sites.
¶Multiple placements were possible.

short-term (e.g., construction and renovations) and long-term (e.g., office supplies, groceries, housing, staff wages) spending. A senior business leader stated that

> when you come here from Toronto, Mississauga, Hamilton [or] wherever … you give up a home in a certain price range, and … housing costs [here] are the lowest in the world, so … now you have a wonderful home but you have money left over, [so] you are spending it on granite top counters [and] upscale bathroom fixtures.

In other words, professionals have higher disposable incomes that offer opportunities for local businesses.

Interviewees identified other economic benefits. For instance, a senior administrator at a community hospital remarked that the ability "to get more physicians to town … allows businesses to find [our town] attractive, because they need to have their employees cared for." An Aboriginal leader noted that "there seems to be more attention paid to the health needs of people in the north because of the med school. And as a result of that, we're starting to see more resources being filtered to specific areas … like diabetes." The arrival of the medical school was considered by many as a way to stimulate, reinvigorate or reinforce other educational and research initiatives.

New learners, teachers or practitioners, as well as new dollars, in combination with existing and developing infrastructure and skills, were believed by several interviewees to provide stimulus for other business opportunities and innovation. For instance, a senior hospital administrator said that getting a medical school "will help us in terms of bringing industry and other things into the north, and attracting different kinds of things that maybe we might not have been able to [get] before."

Diversifying the economy by recruiting more professionals to work in medicine, health or academia was considered beneficial by many respondents. Recruiting spouses, who may be professionals in other fields such as law or engineering, was considered a bonus. The caveat is that spouses needed to be gainfully employed in their fields, which can be a challenge for any community in northern Ontario. Many interviewees thought that every new professional recruited to their communities made it easier to recruit and retain other professionals.

Several interviewees noted that new provincial government funding covered most of the costs associated with NOSM activities. As well, a few interviewees remarked that NOSM activities by themselves were no guarantee of future benefits. The combined message suggests that additional funding and other forms of support, including time and resources invested by the community, were required to fully realize the benefits.

DISCUSSION

The economic contribution of NOSM to northern Ontario was estimated to be $67.1 million in 2007/08 with 85% going to Sudbury and Thunder Bay. The total annual economic contribution in other communities in northern Ontario was $10.0 million. This compares favourably to the US$7.2 million from Montana's part of the WWAMI medical education program that accrues to statewide clinical teaching sites and other communities away from the main campus in Bozeman.[7]

Total spending and NOSM's portion thereof depended on the program type and location. At the community level, the economic contribution of NOSM's educational programs generally increased with increased population size. Although larger communities may have the capacity to participate in more activities than smaller communities, small communities still benefited. For instance, Aboriginal, remote or rural communities, typically with 5000 or fewer people, may realize a minimum economic contribution of $11 000–$12 500 per year by helping to train pairs of first- or second-year undergraduates. Some communities were involved in more activities than their population size alone would predict. This higher level of participation may be because a community is located close to other communities, serves as a local health care referral centre or invests more resources in NOSM activities.

Research in Australia demonstrated a net cost to preceptors' practice for undergraduate medical students, but a net benefit for more advanced medical learners.[25] In a related study, Laurence and colleagues[26] found that rural practices experienced a net financial loss if they taught general practice registrars (doctors), whereas urban practices realized a net gain. Hudson and colleagues[27] found that there was a positive financial benefit to a preceptor's practice after about 2 months into a 12-month integrated community-based clerkship in the third undergraduate year. Lesko and colleagues[28] found that the family medicine residency training program offered by the University of Washington had a net positive financial benefit on preceptors' practices, though some practices showed a net cost. Comparable data were lacking for Canada, and it is not clear if the findings would apply to northern Ontario given differences in the funding of medical care and medical education.

In the opinion of many interviewees, the total economic effect may be much greater than the dollar value insofar as new economic opportunities were identified as an actual or incidental consequence of a community's participation in NOSM's activities. Toomey and colleagues[29] report similar perceptions from community leaders in a study on the potential impact of a distributed medical school on Prince George, BC, and the surrounding area. Evidence from the literature suggests that there are positive outcomes for students, clinicians and communities, particularly in the case of longer placements.[30,31] But, as many interviewees noted, participation in NOSM activities may require additional resources and a commitment by the community to ensure that the activities and other initiatives are fully supported.

Limitations

One limitation of our study was that the data were from fiscal year 2007/08, when NOSM was in its third year after start-up. As such, reported expenditures may not reflect a fully operational medical school. In addition, NOSM was in the process of assuming responsibility for existing postgraduate medical education programs while other programs (e.g., the Northern Ontario Dietetic Internship Program) were in development. As well, model estimates do not include the cost of construction or renovation. Therefore, the reported economic contributions based on spending are likely to be underestimates. However, our built-up estimates for all undergraduate years and a typical postgraduate placement may be more indicative of the economic contribution of a fully operational school. Plans are underway to update the economic assessment, identify actual socioeconomic benefits and costs in communities and in medical practice groups in northern Ontario.

CONCLUSION

Our results show that the impact of distributed medical education extends beyond the production of doctors and other health professionals. When considering the cost of medical education, it may be instructive to examine the broader socioeconomic impact in addition to the level of government expenditure per learner. In the case of northern Ontario, the provincial government's contribution to NOSM translated into a substantial economic contribution and largely positive socioeconomic benefit to participating communities and for the region as a whole.

Acknowledgements: The authors thank their colleagues at the Northern Ontario School of Medicine and the Ontario Ministry of Health and Long-Term Care who compiled administrative data, as well as the interviewees for sharing their insights. The authors greatly appreciate the help provided by colleagues from the Centre for Rural and Northern Health Research.

Competing interests: Ken Adams, Roger Strasser and Joe Lipinski are employed full time, and John Hogenbirk is employed part time by the Northern Ontario School of Medicine. No other competing interests were declared.

Funding: Funding for this study was provided by the Health Human Resources Policy Branch of the Ontario Ministry of Health and Long-Term Care. The views expressed here do not necessarily reflect those of the ministry and no official endorsement by the ministry is intended nor should be inferred.

REFERENCES

1. Tripp Umbach. *2012 annual economic impact, building on 100 years*. University of Alberta, Faculty of Medicine and Dentistry; 2013. Available: http://issuu.com/uafomd/docs/annual_economic_impact_study/1 (accessed 2014 Dec. 3).
2. Tripp Umbach. *The economic impact of Canada's faculties of medicine and health science partners*. Ottawa (ON): The Association of Faculties of Medicine Canada; 2014. Available: www.afmc.ca/pdf/Economic_Impact_Study_Report_FINAL_EN.pdf (accessed 2014 Oct. 21).
3. Enterprise Canada Research. *The economic impact of Ontario's universities*. Toronto (ON): The Council of Ontario Universities; 2001. (Available from Ontario Institute for Studies in Education-Library. 379.11809713 E19).
4. KPMG. *Laurentian University: determining the economic impact of an expanded Barrie campus. Final report*. 2011. Available: http://blog.laurentian.ca/president/wp-content/uploads/2011/09/LU-Economic-Impact-Slides_1.pdf (accessed 2013 Nov. 21).
5. Fogarty JP, Littles AB, Romrell LJ, et al. Florida State University College of Medicine: from ideas to outcomes. *Acad Med* 2012; 87:1699-704.
6. Tesson G, Curran V, Pong RW, et al. Advances in rural medical education in three countries: Canada, the United States and Australia. *Rural Remote Health* 2005;5:397. Available: www.rrh.org.au/articles/showarticlenew.asp?ArticleID=397 (accessed 2013 Nov. 21).
7. Tripp Umbach. Montana's medical school: the economic and social impact of the Montana WWAMI program. 2011. Available: www.montana.edu/wwwwami/Economice%20Impact%20of%20WWAMI.pdf. (accessed 2013 Nov. 21).
8. Strasser R, Lanphear JH, McCready WG, et al. Canada's new medical school: the Northern Ontario School of Medicine: social accountability through distributed community engaged learning. *Acad Med* 2009;84:1459-64.
9. Population and dwelling counts, for Canada, provinces and territories, and economic regions, 2011 and 2006 censuses. Statistics Canada; 2014. Available: www12.statcan.ca/census-recensement/2011/dp-pd/hlt-fst/pd-pl/Table-Tableau.cfm?LANG=Eng&T=1402&PR=35&SR=1&S=9&O=D (accessed 2014 Dec. 4).
10. *National Household Survey: Aboriginal peoples — Aboriginal population profile*. Ontario (code 35) (table). Catalogue no. 99-011-X2011007. Ottawa (ON): Statistics Canada; 2013. Available: www12.statcan.gc.ca/nhs-enm/2011/dp-pd/aprof/index.cfm?Lang=E (accessed 2013 Dec. 9).
11. *Profile of Ontario's francophone community*. Ontario Office of Francophone Affairs; 2009. Available: http://docs.files.ontario.ca/documents/409/francophone-profile.pdf (accessed 2013 Nov. 21).

12. *How healthy are rural Canadians? An assessment of their health status and health determinants*. Ottawa (ON): Canadian Institute for Health Information; 2006. Available: https://secure.cihi.ca/free_products/acknowledgements_rural_canadians_2006_report_e.pdf (accessed 2013 Nov. 21).

13. Glazier RH, Gozdyra P, Yeritsyan N. *Geographic access to primary care and hospital services for rural and northern communities: report to the Ontario Ministry of Health and Long-Term Care*. Toronto (ON): Institute for Clinical Evaluative Sciences; 2011.

14. Strasser R, Hogenbirk JC, Minore B, et al. Transforming health professional education through social accountability: Canada's Northern Ontario School of Medicine. *Med Teach* 2013;35:490-6 Available: http://informahealthcare.com/doi/full/10.3109/0142159X.2013.774334 (accessed 2013 Nov. 21).

15. *Exploring the socio-economic impact of Northern Ontario School of Medicine: final report*. Sudbury (ON): Centre for Rural and Northern Health Research; 2009. Available: www.cranhr.ca/onlrpts.html#Impact (accessed 2013 Nov. 21).

16. Siegfried JJ, Sanderson AR, McHenry P. The economic impact of colleges and universities. *Econ Educ Rev* 2007;26:546-58.

17. Watson P, Wilson J, Thilmany D, et al. Determining economic contributions and impacts: What is the difference and why do we care? *JRAP* 2007;37:140-6.

18. Moore CL, Jacobsen M. Minimum requirements and regional economics, 1980. *Econ Geogr* 1980;60:217-24.

19. Wang X, vom Hofe R. *Research methods in urban and regional planning*. New York: Springer-Verlag; 2007.

20. *2006 census dictionary*. Ottawa (ON): Statistics Canada; 2007. Cat. no. 92-566-XWE. Available: http://www12.statcan.gc.ca/census-recensement/2006/ref/dict/index-eng.cfm (accessed 2013 Nov. 21).

21. *2006 community profiles*. Ottawa (ON): Statistics Canada; 2007. Cat. no. 92-591-XWE. Available: www12.statcan.ca/census-recensement/2006/dp-pd/prof/92-591/index.cfm?Lang=E (accessed 2013 Nov. 21).

22. McCracken MC, Lasota M, Pong RW, et al. *Local economic impact of Sudbury regional hospital and other health care institutions*. Sudbury (ON): Centre for Rural and Northern Health Research; 2001.

23. MacLennan D. *Laurentian University: making an impact in Sudbury*. Sudbury (ON): Laurentian University; 1995.

24. *Highlights of Lakehead University's local economic impact as at September 2011 (based on fiscal 2010/11)*. Thunder Bay (ON): Office of Institutional Analysis and Government Relations, Lakehead University; 2011. Available: http://bolt.lakeheadu.ca/~analysis/Lkhd_Economic_Impact_2010_11_FINAL.pdf (accessed 2013 Nov. 21).

25. Laurence CO, Black LE, Karnon J, et al. To teach or not to teach? A cost-benefit analysis of teaching in private general practice. *Med J Aust* 2010;193:608-13.

26. Laurence CO, Coombs M, Bell J, et al. Financial costs for teaching in rural and urban Australian general practices: Is there a difference? *Aust J Rural Health* 2014;22:68-74.

27. Hudson JN, Weston KM, Farmer EA. Medical students on long-term regional and rural placements: What is the financial cost to supervisors? *Rural Remote Health* 2012;12:1951. Available: http://www.rrh.org.au/articles/showarticlenew.asp?ArticleID=1951 (accessed 2013 Nov. 21).

28. Lesko S, Fitch W, Pauwels J. Ten-year trends in the financing of family medicine training programs: considerations for planning and policy. *Fam Med* 2011;43:543-50.

29. Toomey P, Lovato CY, Hanlon N, et al. Impact of a regional distributed medical education program on an underserved community: perceptions of community leaders. *Acad Med* 2013;88:811-8.

30. Hudson JN, Knight PJ, Weston KM. Patient perceptions of innovative longitudinal integrated clerkships based in regional, rural and remote primary care: a qualitative study. *BMC Fam Pract* 2012;13:72. Available: www.biomedcentral.com/1471-2296/13/72 (accessed 2013 Nov. 21).

31. Walters L, Greenhill J, Richards J, et al. Outcomes of longitudinal integrated clinical placements for students, clinicians and society. *Med Educ* 2012;46:1028-41.

Call for papers

The *Canadian Journal of Rural Medicine (CJRM)* is a quarterly peer-reviewed journal available in print form and on the Internet. It is the first rural medical journal in the world indexed in Index Medicus, as well as MEDLINE/PubMed databases.

CJRM seeks to promote research into rural health issues, promote the health of rural and remote communities, support and inform rural practitioners, provide a forum for debate and discussion of rural medicine, provide practical clinical information to rural practitioners and influence rural health policy by publishing articles that inform decision-makers.

Material in the following categories will be considered for publication.

- Original articles: research studies, case reports and literature reviews of rural medicine (3500 words or less, not including references)
- Commentary: editorials, regional reviews and opinion pieces (1500 words or less)
- Clinical articles: practical articles relevant to rural practice. Illustrations and photos are encouraged (2000 words or less)
- Off Call articles: a grab-bag of material of general interest to rural doctors (e.g., travel, musings on rural living, essays) (1500 words or less).
- Cover: artwork with a rural theme

For more information please visit srpc.ca.

The occasional ED ultrasound: focused assessment with sonography for trauma (FAST)

Kyle Sue, MD, CCFP
Department of Family Medicine, School of Medicine, Queen's University, Kingston, Ont.

Correspondence to: Kyle Sue; ksue@ualberta.ca

This article has been peer reviewed.

INTRODUCTION

The purpose of point-of-care ultrasonography in an emergency setting is to allow physicians to quickly rule in or rule out suspected life-threatening conditions, such as intra-abdominal hemorrhage, as the cause of a patient's abdominal pain or hypotension after sustaining trauma.[1] However, focused assessment with sonography for trauma (FAST) is only a preliminary test in the setting of trauma or hemodynamic instability. One cannot discharge a patient from the emergency department (ED) based solely on a negative FAST. If the patient is hemodynamically unstable and you suspect intra-abdominal hemorrhage, a negative FAST will probably not change your clinical suspicion.[2] Your primary goal for the occasional ultrasound in the rural ED is to assess it safely. The key to safety is not the ability to call a scan positive or negative, but knowing how to correlate your findings clinically. If you are not sure, continue management as if you had never done the scan at all.[3,4]

EQUIPMENT

- Any ultrasonography machine
- Low frequency (2–5 MHz) curvilinear probe (Fig. 1)
- Ultrasound gel or water-based lubricant

IMAGE GENERATION AND INTERPRETATION

Ultrasound scans are a cross-section of the area you are scanning, from superficial to deep (top of screen to bottom of screen). The convention is to hold the probe with the probe marker oriented toward the patient's head (cephalad). The probe marker corresponds to the side of the screen with the marker dot (conventionally on the top left side of the screen). Therefore, the left side of the screen will correspond to the cephalad direction. The probe is held longitudinally (parallel with the plane of the patient's body).[4]

FAST scans of the abdomen include the right upper quadrant (RUQ), left upper quadrant (LUQ) and suprapubic locations (Fig. 2). Though the subcostal cardiac view is considered a part of FAST, it will not be discussed in this article. All of the following scans are done with the patient lying supine.[4,5]

Right upper quadrant view

In the RUQ, important landmarks for FAST scans include the liver, kidney and diaphragm (Fig. 3). The hepatorenal space (Morison pouch) is the second lowest part of the supine abdomen, after the pelvis. However, any clinically significant intraperitoneal bleed will rapidly overflow from the pelvis into the RUQ via the right paracolic gutter. Blood in the LUQ tracks into the RUQ via the phrenicocolic ligament without needing to be diverted through the pelvis. In the RUQ, free fluid preferentially collects in the hepatorenal space, creating a solid black stripe between the 2 organs.[4] This view is able to detect intraperitoneal bleeding in 82%–95% of hypotensive patients with an

abdominal source of bleeding.[3,4,6] However, it must be noted that FAST can only reliably detect free fluid of more than 250–600 mL in adults.[4,7,8] If there is no solid black stripe between the liver and the kidney, then there is either no free fluid or less than the limit of detection.

Right upper quadrant scan

To perform the scan, hold the probe longitudinally, with the probe marker facing cephalad, at the level of the right costal margin in the anterior to mid-axillary line. While keeping the probe held in the same location on the patient's body, gently sweep anteriorly and posteriorly by tilting the probe. If you are unable to generate an image with anything recognizable, reposition the probe cephalad or caudad 1 or 2 rib spaces and try again. You can also try repositioning the probe more anteriorly or posteriorly until you can clearly identify the kidneys, which are posterior (retroperitoneal). It is prudent to visualize the entire hepatorenal interface, which involves being able to see the superior (diaphragmatic) edge of the liver and the liver tip, and sweeping the probe anteriorly and posteriorly until the kidney disappears from the screen in either direction. It is not necessary to be able to see the entire hepatorenal interface on the screen at any given time, but the parts that you are not able to see, you must visualize separately by repositioning the probe. The combination of images needs to show you the entire interface for you to call a scan negative. However, if at any time you visualize free fluid, you can call the scan positive without having seen the entire interface.[4]

Left upper quadrant view

In the case of a splenic or left diaphragmatic injury, early detection of bleeding can be done with this view before the fluid overflows into the RUQ. Unfortunately, the LUQ view is more challenging than the RUQ view. This is because the spleen is smaller and more mobile than the liver, as well as higher and more posterior. Ribs can therefore easily be in the way of scanning.[4] The spleen is also close to the stomach, which can obscure the spleen or have its contents cause you to think that there is free fluid present.[4,6] Also, bowel gas can more easily impede scanning in this quadrant than in the RUQ.

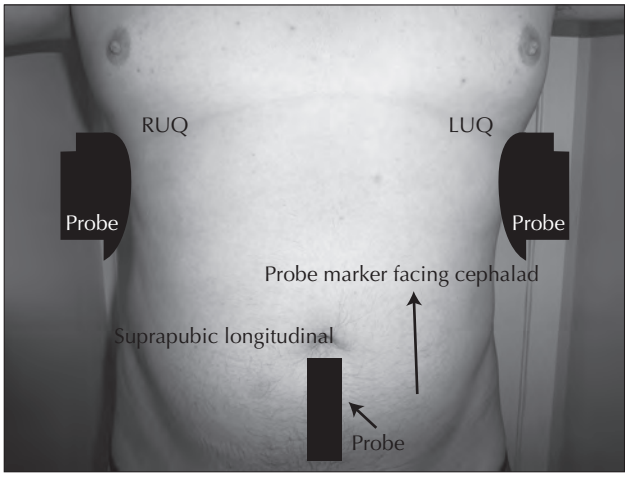


Fig. 2. Approximate positions of probes on patient's body for right upper quadrant (RUQ), left upper quadrant (LUQ) and suprapubic longitudinal views. The suprapubic transverse view is not shown.

Fig. 1. Low frequency (2–5 MHz) curvilinear probe.

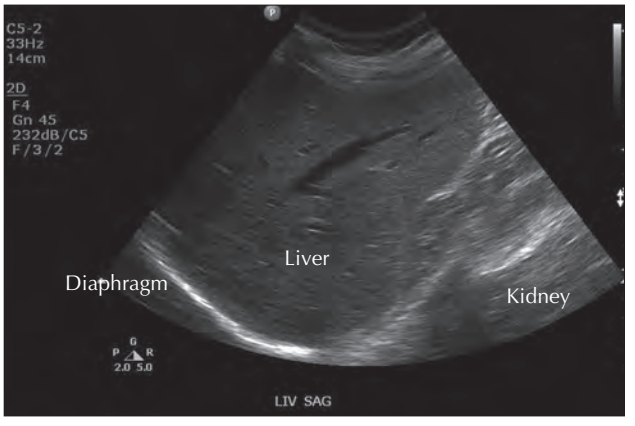


Fig. 3. Normal right upper quadrant view (on this still image, the entire hepatorenal interface is not visualized, so based on this image only, the scan is indeterminate, not negative).

Left upper quadrant scan

To do the scan, hold the probe longitudinally, with the probe marker facing cephalad, at the level of the left costal margin in the posterior axillary line (more posterior than for the RUQ view) with your hand almost resting on the bed. Because the spleen is more superior than the liver, you will likely need to position the probe more superiorly than on the right side. As with the RUQ scan, reposition the probe more cephalad or caudad, as needed, in order to visualize the spleen and the kidney. Sweep the probe anteriorly and posteriorly until the spleen disappears from the screen in either direction. On the LUQ view, fluid preferentially collects between the diaphragm (solid white curved line to the left of the spleen on the screen) and the kidney (Fig. 4). However, when there are large volumes of fluid, it can also collect in the splenorenal space. The diaphragm needs to be visualized to at least the 9 o'clock position on the screen to definitively call a negative scan.[4]

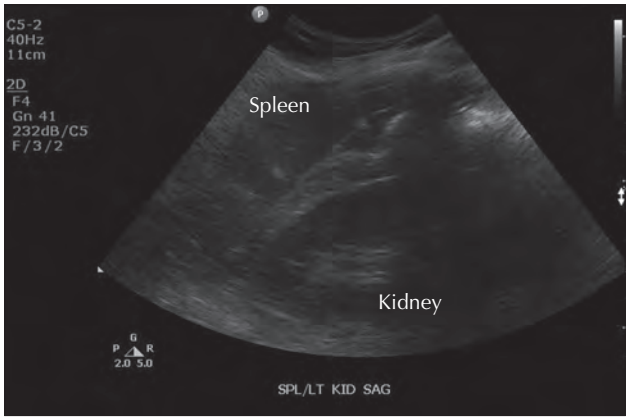


Fig. 4. Indeterminate left upper quadrant view (no diaphragm [thick white line] visualized left of the spleen on the screen).

Suprapubic view

Minor bleeds can be easily detected with this view, especially if their origin is in the pelvis. In men, the area of interest with this view is the rectovesicular pouch. In women, the area of interest with this view is the rectouterine pouch (Douglas pouch).

Suprapubic scan

One can begin either with a transverse view or a longitudinal view. To do the longitudinal view, hold the probe longitudinally with the probe marker facing cephalad, placed in the abdominal midline between the umbilicus and the symphysis pubis, at a 90° angle to the skin. You may need to angle the probe 30° to 45° caudad (rather than completely upright at 90° to the skin) to visualize the bladder. The bladder appears as a fluid-filled organ (superficial black mass). In men, look for any black stripe posterior to the bladder (below the bladder on the screen). In women who have not had a hysterectomy, the uterus is a solid structure visualized immediately behind the bladder (Fig. 5). Look for any black stripe posterior to the uterus to identify free fluid.[4] A full bladder makes the suprapubic scan much easier to do, because urine (fluid) conducts ultrasound waves very well, giving a good "acoustic window." It is an option to instill 250 mL of fluid into the bladder via a Foley catheter to allow you to obtain a better picture, if you are having a difficult time getting a clear image with identifiable structures.[4,6] From the longitudinal view, immediately rotate the probe 90° counterclockwise to obtain the transverse view (probe marker facing to the patient's right)[4] (Fig. 6).

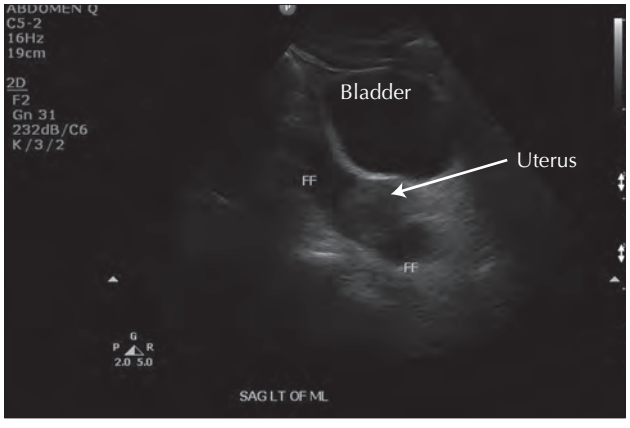


Fig. 5. Positive suprapubic longitudinal scan left of midline on patient (free fluid [FF] seen on both sides of the uterus deep to the bladder and also in a thin line deep to the uterus in the rectouterine space).

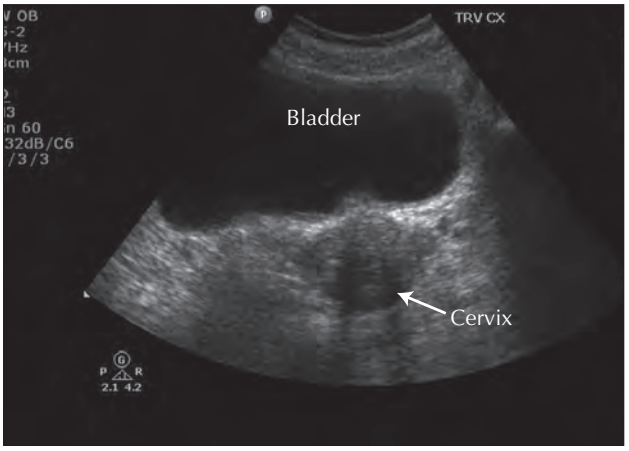


Fig. 6. Normal suprapubic transverse view (no fluid seen deep to the bladder on either side of the uterus/cervix, and no fluid seen deep to the uterus/cervix).

CASES

Case 1

A 32-year-old man is involved in a high-speed snowmobile rollover on the local mountain. He is brought in by paramedics 1 hour after the accident. He is alert and oriented, with a Glasgow Coma Scale score of 15. His blood pressure is 130/80 mm Hg, heart rate is 110 beats/min, respiratory rate is 16 breaths/min and blood oxygen saturation as determined by pulse oximetry (SpO_2) is 97% on room air. He reports abdominal pain. As an adjunct to your primary survey, you reach for the bedside ultrasonography machine to conduct a FAST scan. Your findings are shown in Figure 7.

In this case, the patient remains stable, so you can safely arrange computed tomography (CT), if available, to assess where the patient is bleeding from and whether he will need surgical management.[2] If CT is not available, ensure the patient is given intravenous fluids and possibly packed red blood cells before transfer to your referral hospital with surgical capabilities.[7]

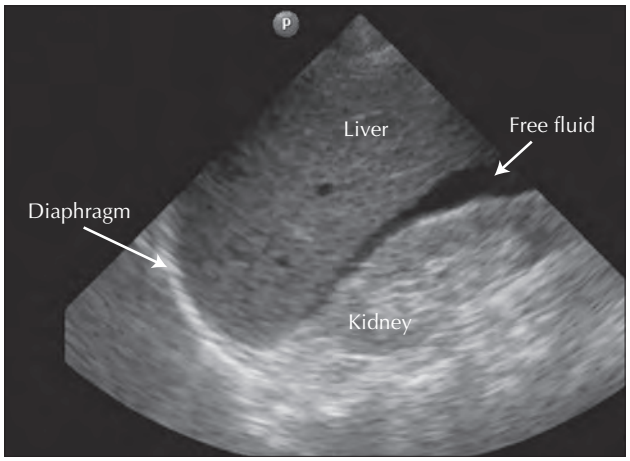


Fig. 7. Positive right upper quadrant view (free fluid in hepatorenal space).

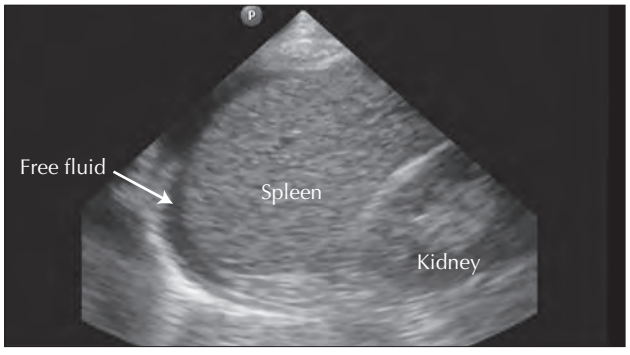


Fig. 8. Positive left upper quadrant view (free fluid between spleen and diaphragm).

Case 2

An 80-year-old woman was seen falling down a 10-m flight of stairs, and was brought into your rural ED by family members within 15 minutes of the accident. On arrival, she is diaphoretic and visibly short of breath. She appears confused and is unable to respond to any of your questions. Her blood pressure is 80/60 mm Hg, heart rate is 130 beats/min, respiratory rate is 30 breaths/min and SpO_2 is 88% on room air. While doing your primary survey and initiating appropriate resuscitation, you reach for your ultrasound probe to do a FAST scan. Your findings are shown in Figure 8.

In this case, your FAST scan finds free fluid from a hemorrhage secondary to a splenic injury (not visible in Fig. 8). Although you have found this, you must still rule out other potential causes of shock after trauma, such as tension pneumothorax or cardiac tamponade, which should become clear on physical examination or further ultrasonography. For high-impact traumas, there could be more than one contributor to shock.[4]

This patient needs surgery as soon as possible.[2]

Case 3

A 40-year-old male pedestrian crossing an unlit rural intersection at night is hit by a drunk driver at 30 km/h. He is tossed 50 m into a cornfield. Paramedics bring him into your ED, alive but unconscious. His blood pressure is 80/60 mm Hg, heart rate is 60 beats/min, respiratory rate is 25 breaths/min, SpO_2 is 88% on 15 L of supplemental oxygen by nonrebreather. While doing your primary survey and initiating appropriate resuscitation, you perform a FAST scan, which is negative for free fluid (Figs. 9 and 10). Given the hypotension and bradycardia, he is likely to have neurogenic shock. However, given the mechanism of injury, one cannot rule out an intraperitoneal bleed that has simply not yet reached the volume required for detection. If his condition stabilizes, it would be appropriate to do another FAST scan to see if there has been any interval change.[2,4]

Case 4

A 15-year-old boy falls off his skateboard while doing a jump at the local skate park. He falls 5 m onto concrete. In addition to multiple broken bones in his extremities, he is actively vomiting and complains of abdominal pain. His blood pressure in the ED 1 hour after the accident is 120/80 mm Hg, heart rate is 95 beats/min, respiratory rate is 18 breaths/min and

SpO_2 is 97% on room air. As part of your primary survey, you conduct a FAST scan to see if there is intraperitoneal bleeding as a cause of his abdominal pain. Your FAST scan is negative.

Thirty minutes later, he reports that his abdominal pain is worsening. A repeat FAST scan is negative. Two hours later, his blood pressure drops to 90/60 mm Hg and his heart rate is 110 beats/min. This time, the FAST scan is positive for free fluid (Fig. 11). A CT scan later identifies a subtle splenic laceration.

This case demonstrates the utility of doing serial FAST scans for a patient who is clinically stable but whom you highly suspect could have an intra-abdominal bleed.[2,4,6,7,9]

CAVEATS

False positives

- Perinephric fat can be easily confused with free fluid. However, fat does not conduct ultrasound waves to the same degree as fluid. Therefore, fat will appear more echogenic (lighter) and more blurry than the dark uniform line one expects with free fluid. If you are unsure, compare your image to the other side of the abdomen. If the same image appears on both sides, it can be reassuring that this is fat rather than fluid.[4,6]
- Ascites is a form of intra-abdominal free fluid. Therefore, for a patient who has pre-existing ascites, one cannot use a FAST scan to rule out an intra-abdominal hemorrhage. Peritoneal dialysis fluid and urine from a ruptured bladder will also look identical to free fluid.[4,6]
- Physiologic free fluid is often present in a small amount in women. Therefore, a small volume of fluid in the pelvis can be normal, though usually less than what a FAST scan can detect. Clinical correlation is necessary.[4,6]
- Intraluminal bowel and intragastric fluid can both mimic free fluid. However, fluid in the bowel or stomach should appear within loops of bowel or the stomach, and can usually be

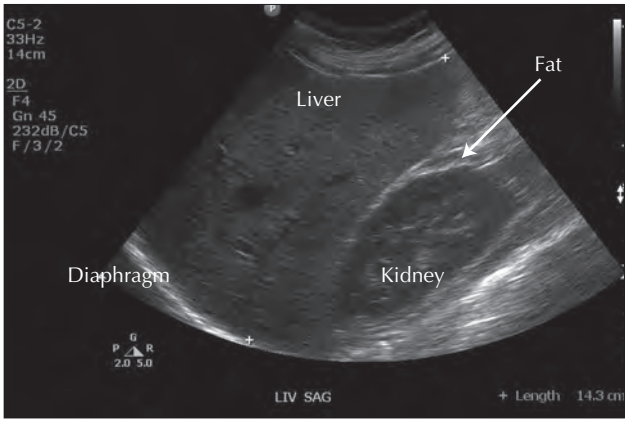


Fig. 9. Right upper quadrant view (no free fluid in this still image; can be called negative if entire interface shows no free fluid).

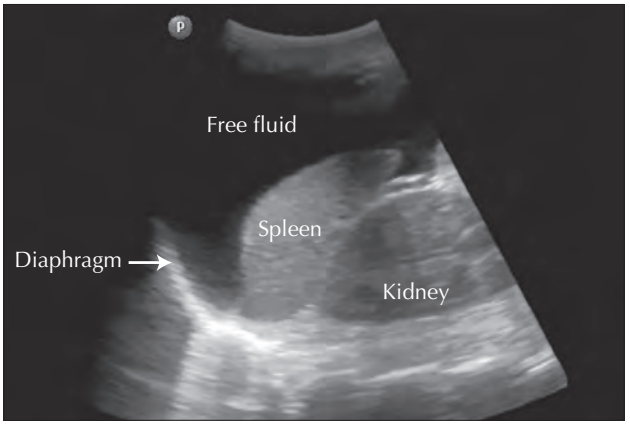


Fig. 11. Positive left upper quadrant view (very large volume of free fluid between the diaphragm and spleen).

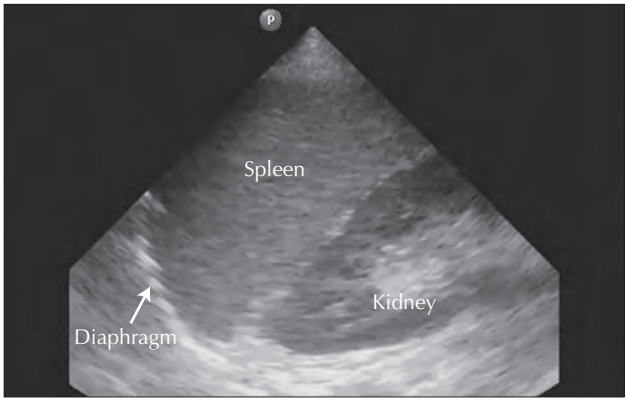


Fig. 10. Left upper quadrant view (no free fluid in this still image; can be called negative if entire interface shows no free fluid).

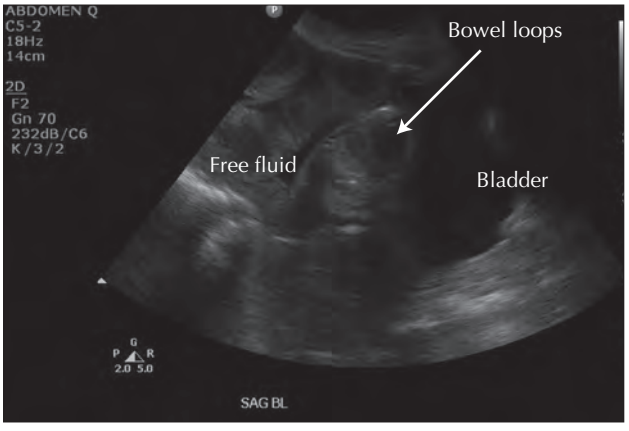


Fig. 12. Suprapubic longitudinal view showing free fluid superior to the bladder and around loops of bowel.

identified on the screen (Fig. 12). The fluid should appear contained within a structure rather than free flowing within the abdomen. Look also for peristalsis, which might be the biggest giveaway. Also, keep in mind the 3 locations where free fluid preferentially flows in the abdomen. If the fluid you see is not in any of those 3 locations, chances are low that it is free fluid.[4,6] The prostate in men can sometimes appear like free fluid. However, similar to perinephric fat, it is more echogenic (brighter) than the nonechogenic (dark) free fluid, and will appear to be confined to a structure shaped like the prostate. If unsure, one can simultaneously do a digital rectal examination. If the area in question moves on the screen when the prostate is palpated, it is the prostate.[4]

- The gallbladder or any cysts can be confused as free fluid. However, the fluid within these structures will be neatly confined to an oval or round shape with echogenic walls[4] (Fig. 13). Blood vessels (e.g., hepatic vessels or inferior vena cava) or biliary ducts can be mistaken for free fluid (Fig. 13). Again, these structures will appear as fluid neatly contained within a tubular structure.[4]

False negatives

- Adhesions can constrict free fluid to a localized area that the FAST scan fails to pick up, because the fluid never reaches the most dependent locations in the abdomen.[4]
- Delayed presentations can be problematic.[2,4,6,7,9] Case 4 is one such example. Another possibility is that after 12–24 hours posttrauma, the blood may have clotted. Clotted blood will appear as a more echogenic area (whiter/brighter), which can be easily missed.[4,6] However, if the patient is still alive 24 hours posttrauma with an intra-abdominal hemorrhage, they probably do not require emergency surgery.[4]
- Moving one's hands too quickly while sweeping can easily cause the clinician to miss subtle fluid collections without realizing[4] (Fig. 14).

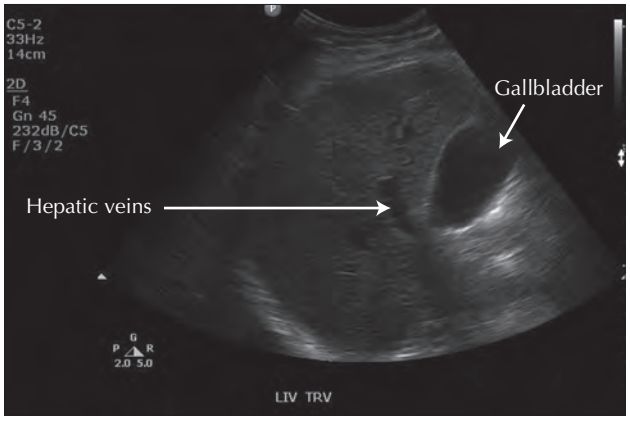


Fig. 13. Right upper quadrant view showing the gallbladder and hepatic veins, which can be mistaken for free fluid.

TROUBLESHOOTING

- Place the patient in a Trendelenburg position of 5° for 15–20 minutes for both RUQ and LUQ views. This can help bring small amounts of fluid into the dependent locations in the upper quadrants. Conversely, the reverse Trendelenburg position will help bring fluid into the most dependent part of the pelvis, decreasing the amount of free fluid needed for reliable detection by 50%.[4]

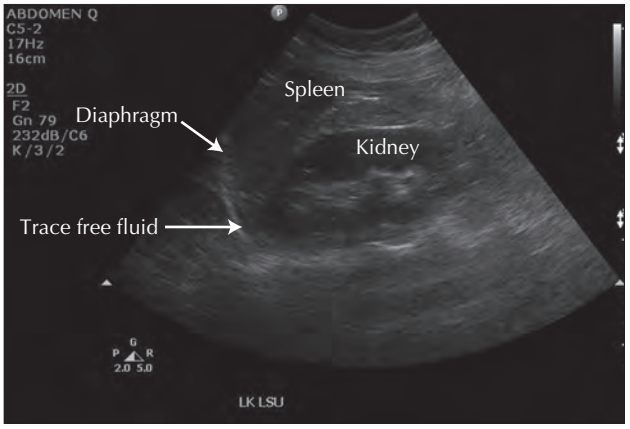


Fig. 14. Left upper quadrant view showing trace free fluid between the diaphragm and spleen.

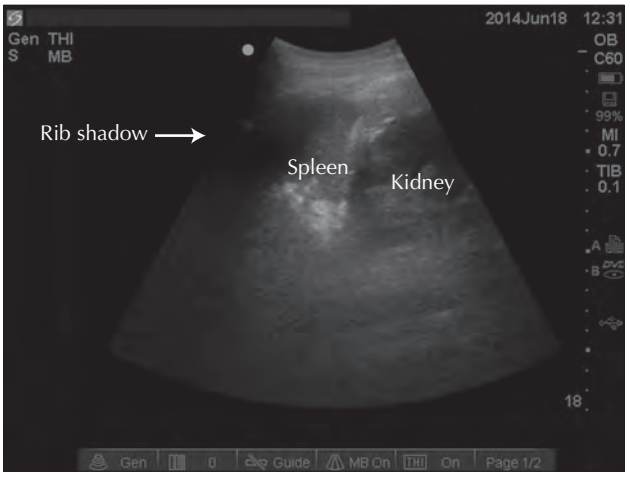


Fig. 15. Left upper quadrant view showing a rib shadow obscuring the diaphragm and part of the spleen.

- Start your scan at maximal depth on the screen, and decrease the depth as needed. This ensures you do not miss anything that is cut off on the screen at low depth.
- Angle the probe around 30° to get rib shadows out of the way, if the rib shadows are preventing you from seeing the landmarks and interfaces you are seeking[4] (Fig. 15). Have the patient take a deep breath and hold. This can sometimes shift your landmarks into places where they are not obscured by bowel gas or rib shadows.[4]
- Rescan or perform serial scanning (see case 4).
- Adjust the gain if your image is too dark or too bright for you to differentiate structures or clearly visualize what you are seeking.[4]

Acknowledgement: The author thanks Dr. Richard McCrea of Saskatchewan for generously exposing his abdomen for Figure 2 of this publication.

Competing interests: None declared.

REFERENCES

1. Tso P, Rodriguez A, Cooper C, et al. Sonography in blunt abdominal trauma: a preliminary progress report. *J Trauma* 1992;33:39-43; discussion 43-4.
2. Boulanger BR, et al. Prospective evidence of the superiority of a sonography-based algorithm in the assessment of blunt abdominal injury. *J Trauma* 1999;47:632-7.
3. Stengel D, et al. Emergency ultrasound-based algorithms for diagnosing blunt abdominal trauma [review]. *Cochrane Database Syst Rev* 2013; (7):CD004446 10.1002/14651858.CD004446.pub3.
4. Wiss R, Socransky S. *Point-of-care ultrasound for emergency physicians: "the EDE book."* 2012; 73-100.
5. Boulanger BR, et al. Emergent abdominal sonography as a screening test in a new diagnostic algorithm for blunt trauma. *J Trauma* 1996;40:867-74.
6. Tsui CL, Fung HT, Chung KL, et al. Focused abdominal sonography for trauma in the emergency department for blunt abdominal trauma. *Int J Emerg Med.* 2008;1:183-7.
7. Smith ZA, et al. FAST scanning in the developing world emergency department. *S Afr Med J* 2010;100:105-8.
8. Branney SW, Wolfe RE, Moore EE, et al. Quantitative sensitivity of ultrasound in detecting free intraperitoneal fluid. *J Trauma* 1995;39:375-80.
9. Sherbourne CD, Shanmuganathan K, Mirvis SE, et al. Visceral injury without hemoperitoneum: a limitation of screening abdominal sonography for trauma. *Emerg Radiol* 1997;4:349-54.

A plea, an apology and a revelation

Jean-Gaston DesCôteaux, MA, MD, FRCSC
Golden and District Hospital, Golden, BC

Correspondence to:
Jean-Gaston DesCôteaux;
jgaston.descoteaux@gmail.com

Let us never forget that we are all on the same team, whose only goal is the patient's well-being.

I work in a rural community of 5000 people nestled between 2 mountain ranges on the Trans-Canada Highway. I am a general surgeon and the only specialist in town. Ours is an 8-bed hospital, with a single operating room (smaller than most people's bedrooms), a delivery room and a 5-bed emergency department, including a recently renovated trauma bay. We have 6 units of packed red blood cells on hand, no platelets and no fresh frozen plasma.

Recently, a 67-year-old patient with diabetes presented to the emergency department with a 12-hour history of pain in her foot that now involved her leg up to the groin. This was despite peripheral neuropathy that normally left her foot completely numb. A plain film radiograph revealed extensive tracking of subcutaneous air in what remained of her foot following a mid-foot amputation a year ago for end-stage vascular disease.

This could have been the case of the 4-month-old baby with *Staphylococcus aureus* septicemia, the 2-month-old infant with acute congestive heart failure or the 59-year-old patient with acute gastrointestinal bleed from a duodenal tumour. Regardless, in each case, urgent tertiary care was required. In this particular case, our emergency physician contacted transport agencies, and 2 hours later we were speaking with a consultant who proceeded to question the necessity of the transfer: "If she has no fever, she can't be that sick"; "If you think she has necrotizing fasciitis, why don't you just incise the skin to see if the fascial planes are involved?"; "Her white count is normal? Well, she can't be that sick." The thought process was obviously driven by a desire to find a reason not to accept the patient in transfer.

I know, because I used to be on that end of the line. Until 5 years ago, I practised as an academic surgeon in that very same facility. I remember the telephone calls from physicians in rural communities late in the evening after I had finished 10 emergency consultations and still had 4 cases to attend to in the operating room that night. I honestly can't recall the tone of my conversations, but, if I was ever rude, I sincerely apologize.

I do remember, during my days of training, the close relationship that existed between referring physicians and consultants. One of my preceptors still had a family physician who would come to assist when his patients were having surgery. Medical professionals from rural communities would contact a consultant directly by telephone because they had a personal and professional relationship, which greatly facilitated communication and the understanding of a patient's problem.

When I left the big centre, I believe some of my colleagues were dismayed: "Why would you want to throw all this away?" "You're going to give up all your skills?"

Well, let me tell you. I share an office with a fine group of family physicians, each of whom has expertise in a particular domain: anesthesiology, obstetrics, emergency medicine, critical care, bedside ultrasonography and alternative medicine. My own expertise is one part of the services we are able to provide. Consultations can take place almost immediately and occur in both directions. Just as I am able to assist with a surgical issue, someone is always at hand to assist me with a nonsurgical

aspect of a patient's problem. I believe we are able to provide a more holistic approach. Far from losing skills, I've gained an entirely new set of abilities.

Decision-making now involves many more factors: availability of diagnostic tests, medication and equipment; skill level of staff; time to transport; weather; road closures; and course of a condition with or without treatment. Sometimes a situation occurs in which it is necessary to perform a more complex procedure than we would normally consider. When the patient says, "Doc, do what you think is best, I trust you," I feel the weight of the world on my shoulders. For all intents and purposes, each patient is a neighbour. A surgical procedure never has a guaranteed outcome. The reward comes when I meet that same patient in the grocery store and they tell me, "Doc, I haven't felt this great in a year," or "You know, I'm glad you talked me out of that operation."

The chasm between urban and rural medicine has been revealed to me. They truly are 2 solitudes. I see the growth of bureaucratic systems intended to manage increasingly more complex organizations getting in the way of collaboration between urban and rural practitioners. Rural communities are left with more difficult access to diagnostic tests and treatments. Physicians in urban centres have more than enough work. Both have increasingly limited resources, and they don't know each other. There really is no incentive to take on the problems of other communities. To compound the problem, provinces are becoming more protective and limiting out-of-province patients from accessing their services, which negatively affects small border communities.

I don't have a solution in my pocket, but I know there are a lot of highly qualified hard-working people in the trenches who continue to do the best they can with what they have. Whether you are requesting or providing assistance, think of that the next time you pick up the telephone to speak with a colleague.

Competing interests: None declared.

Country Cardiograms

Have you encountered a challenging ECG lately?

In most issues of *CJRM* an ECG is presented and questions are asked.

On another page, the case is discussed and the answer is provided.

Please submit cases, including a copy of the ECG, to Suzanne Kingsmill, Managing Editor, *CJRM*, 45 Overlea Blvd., P.O. Box 22015, Toronto ON M4H 1N9; cjrm@cjrm.net

Cardiogrammes ruraux

Avez-vous eu à décrypter un ECG particulièrement difficile récemment?

Dans la plupart des numéros du *JCMR*, nous présentons un ECG assorti de questions. Les réponses et une discussion du cas sont affichées sur une autre page.

Veuillez présenter les cas, accompagnés d'une copy de l'ECG, à Suzanne Kingsmill, rédactrice administrative, *JCMR*, 45, boul. Overlea, C. P. 22015, Toronto (Ontario) M4H 1N9 ; cjrm@cjrm.net

Career/Classified Advertising
Carrières et annonces classées

The Ontario Human Rights Code prohibits discriminatory employment advertising.

The *Canadian Journal of Rural Medicine* (*CJRM*) is pleased to accept classified advertisements. The deadline is 1 month before issue date. Classified rates: 1 page $1020; 2/3 page $975; 1/2 page $830; 1/3 page $635; 1/4 page $530. Colour rate available upon request. Visa, MasterCard and American Express accepted.

Advertisements should be sent to: Journal Advertising, *CJRM*, 1867 Alta Vista Dr., Ottawa ON K1G 5W8; tel 800 663-7336 or 613 731-8610 x2107/2041; fax 613 565-7488; advertising@cma.ca

Le Code des droits de la personne de l'Ontario interdit la discrimination dans la publicité relative à l'emploi.

Le *Journal canadien de la médecine rurale* accepte volontiers les annonces classées. Celles-ci doivent être reçues au Journal au plus tard 1 mois avant la date de parution. Tarif des annonces classées : 1 page, 1020 $; 2/3 page, 975 $; 1/2 page, 830 $; 1/3 page, 635 $; 1/4 page, 530 $. Tarif couleur disponible sur demande. Visa, MasterCard et American Express acceptés.

Le texte des annonces doit être adressé à : Annonces classées, *Journal canadien de la médecine rurale*, 1867, prom. Alta Vista, Ottawa ON K1G 5W8; tél. 800 663-7336 ou 613 731-8610 x2107/2041; fax 613 565-7488; advertising@cma.ca

INTERIOR HEALTH OPPORTUNITIES

FAMILY PHYSICIAN: BC – Ashcroft. Ashcroft Hospital and Community Health Centre is a Level 1 Community Hospital with four emergency beds, 24 extended care beds, and one respite care. Ashcroft (population: 1,664) rests along the banks of the Thompson River, deep in the heart of British Columbia's desert country. The town is set amid a spectacular recreational environment where hiking, golfing, and fishing thrive. Remuneration is fee-for-service $300-350,000+/-, plus rural retention incentives and on-call availability payment. Overhead is around 20% and the office has a fully integrated EMR. For more information email physicianrecruitment @interiorhealth.ca or online www.betterhere.ca –RM-318

FAMILY PHYSICIAN: BC – Clearwater. Family physicians wanted to join the medical team in this beautiful community. Rural setting, relaxed pace of work, newer hospital, and an amazing provincial park as your backyard. Known for world-class recreation, enriched culture, and vibrant community life, Clearwater offers the balanced lifestyle you have been looking for. Enjoy working in a single group practice with electronic medical records, a modern acute care facility, and a 21-bed residential care facility. Payment structure is fee-for-service plus multiple incentives: The Rural Physicians for British Columbia incentive provides a one-time incentive payment of $100,000 for a 3-year return of service; recruitment incentive $20,000; retention fee premium 21.14%; retention flat fee $18,482.40; and relocation reimbursement. For more information contact: email physicianrecruitment @interiorhealth.ca or view us online at our Web site www.betterhere.ca –RM-281a

FAMILY PHYSICIAN: BC – Lillooet. Five-physician, unopposed fee-for-service practice seeks sixth family physician with ER skills. Clinic group focus is on balance of work and lifestyle. Easy access to lower mainland, Whistler and interior of province. Call currently 1-in-5. Regular schedule includes one week off every fifth week. Full Rural Physician Recruitment and Retention benefits eligibility, including 38 days rural locum coverage for holidays. World-class wilderness at your doorstep for skiing, hiking, fishing, whitewater kayaking and mountain biking. Full service rural hospital with GP Surgeon and Anesthetist on staff. For more information email physicianrecruitment @interiorhealth.ca or view online at Web site www .betterhere.ca –RM-282b

FAMILY PHYSICIAN: BC – Logan Lake is situated in the Heart of the Highland Valley; a pristine natural environment of mountains, lakes and forests. Logan Lake is a growing, progressive and family-oriented community. This is a full service family practice with acute care clinic coverage. We have a turnkey operation with Wolf EMR and no startup costs for a new physician. Also, only 60 km away is a tertiary level hospital, Royal Inland Hospital, Kamloops. Remuneration is fee-for-service $300-500,000+/-, plus rural retention incentives and on-call availability payment. For more information email physicianrecruitment@interiorhealth.ca or view online www.betterhere.ca –RM-317

FAMILY PHYSICIANS: BC – Merritt. Rolling hills, sparkling lakes and over 2,030 hours of sunshine every year make Merritt a haven for four-season outdoor recreation. We have a need for family physicians in their choice of clinic. Nicola Valley Hospital and Health Centre is a 24-hour Level 1 community hospital with a 24-hour Emergency Room. Also, only 86 km away is a tertiary level hospital, Royal Inland Hospital, Kamloops. Remuneration is fee-for-service $250-$450,000+, rural retention incentives and on-call availability payment. For more information email physicianrecruitment@interiorhealth.ca or view online www.betterhere.ca –RM-311

FAMILY PHYSICIANS: BC – Nelson. The city of Nelson is seeking family physicians for their vibrant, active community. There are both part-time and full-time opportunities available in well-established clinics. With supportive colleagues to share the responsibilities of in-hospital patients, clinics operate with EMR systems, along with very efficient and friendly staff. Clinic physicians are very supportive to new colleagues establishing their practice and providing coverage for hospital inpatients. Specialist support is available at the local hospital, including internal medicine, ophthalmology, neurology and pediatrics, with additional services regionally. There is also the additional option of doing emergency room work and obstetric care. Room for growth! With its friendly people and scenic location among rivers, mountains, and lakes, the area offers a wide range of year-round outdoor recreational opportunities. Remuneration can be discussed when determining which clinic is a good match for you, plus multiple incentives: recruitment $15,000; retention fee premium 11.62%; with a retention flat fee $12,107.96. For more information email physicianrecruitment@interiorhealth.ca or view us online at our Web site www.betterhere.ca –RM-293

FAMILY PHYSICIANS: BC – Princeton. Family physicians wanted to join our dynamic team of four GPs and one NP for our busy clinic and hospital. We have a six-bed inpatient hospital with a 24 hour ER, which is attached to the Cascade Medical Centre providing full family practice services to a community population of 3,000 and a surrounding catchment population of approximately 6,000. Fee-for-service, $250,000 to $400,000, with excellent rural incentives and on-call availability payment. For more information, email physicianrecruitment@interiorhealth.ca or view online www.betterhere.ca –RM-328

www.betterhere.ca Interior Health

Discover the perfect place to call home.

Practice Medicine in British Columbia.
Enrich Your Career.
Enhance Quality of Life.

Join the hundreds of physicians who have moved to rural British Columbia (BC) to enjoy a quality of life that is envied around the world. Our physician services team can assist you with licensing and immigration, and match your skills and interests with exciting career opportunities.

Visit our website to view current opportunities.

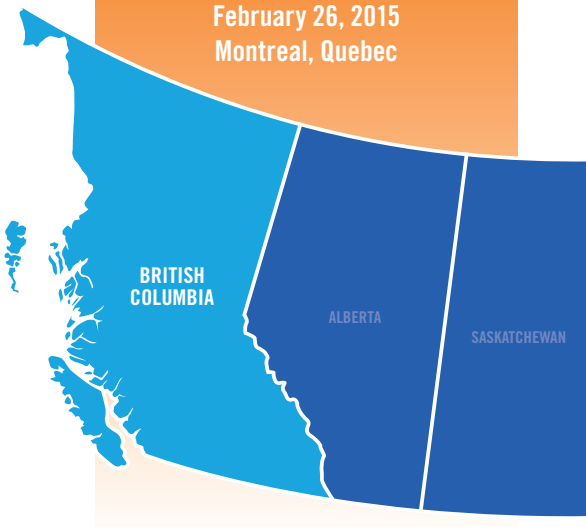
Enjoy a quality of life that is envied around the world – **register online today!**

healthmatchbc.org

Meet with our Team

FMRQ's Outside Quebec Career Day

February 26, 2015
Montreal, Quebec



health match bc

E welcome@healthmatchbc.org
T 1.877.867.3061

BRITISH COLUMBIA

Photos: Destination BC, Tourism BC, Picture BC & Ted Swanky

A free health professional recruitment service funded by the Government of British Columbia, Canada

RM-332

PART OF THE NOVARTIS COPD PORTFOLIO

Open up to a LAMA option in COPD

IMPROVED PATIENTS' QUALITY OF LIFE

(LS mean change in SGRQ total score vs. placebo, -3.32; $p<0.001$)[1,2†]

ONCE-DAILY Pr SEEBRI® BREEZHALER®

DEMONSTRATED 5-MINUTE ONSET AND 24-HOUR BRONCHODILATION

- FEV_1 improvement shown 5 minutes after first dose (0.093 L vs. placebo, $p<0.001$, serial spirometry)[1,3‡]
- Significantly greater LS mean FEV_1 vs. placebo demonstrated at all time points over 24 hours (LS mean FEV_1 [L] vs. placebo after first dose, $p<0.001$; time points were 5 min, 15 min, 30 min, 1 hr, 2 hrs, 3 hrs, 4 hrs, 6 hrs, 8 hrs, 10 hrs, 12 hrs, 23 hrs 15 min, 23 hrs 45 min)[4§]

Indication & clinical use:

SEEBRI® BREEZHALER® is indicated as a long-term once-daily maintenance bronchodilator treatment in patients with chronic obstructive pulmonary disease (COPD), including chronic bronchitis and emphysema.

- Not indicated for the relief of an acute deterioration of COPD
- Can be used at the recommended dose in elderly patients 65 years of age and older
- Should not be used in patients under 18 years of age

Relevant warnings and precautions:

- Not indicated for treatment of acute episodes of bronchospasm
- Not indicated for treatment of acutely deteriorating COPD
- Worsening of narrow-angle glaucoma
- Worsening of urinary retention
- In severe renal impairment, use only if the expected benefit outweighs the potential risk
- Paradoxical bronchospasm

For more information:

Please consult the Product Monograph at www.novartis.ca/asknovartispharma/download.htm?res=seebri%20breezhaler_scrip_e.pdf&resTitleId=665 for important information relating to adverse events, drug interactions, and dosing information which have not been discussed in this piece. The Product Monograph is also available by calling the Medical Information Department at 1-800-363-8883.

LAMA: long-acting muscarinic antagonist; COPD: chronic obstructive pulmonary disease; LS: least square; SGRQ: St. George's Respiratory Questionnaire, measures health-related quality of life in symptoms, activities and impact on daily life[5]; FEV_1: forced expiratory volume in 1 second.

† GLOW2: A 52-week, randomized, double-blind, placebo-controlled parallel-group study of 1,060 patients with COPD. Patients received either SEEBRI® BREEZHALER® (glycopyrronium 50 mcg o.d.; n=525), placebo (n=268), or open-label tiotropium (18 mcg o.d.; n=267) as an active control. Primary endpoint was 24-hour post-dose (trough) FEV_1 following 12 weeks of treatment.

‡ GLOW1: A 26-week, randomized, double-blind, placebo-controlled parallel-group study to assess the efficacy, safety and tolerability of once-daily SEEBRI® BREEZHALER® (50 mcg) in patients with COPD (n=550); placebo (n=267).

§ LS mean FEV_1 (L) after first dose; SEEBRI® BREEZHALER® (n=169) vs. placebo (n=83), respectively: 5 min: 1.39 vs. 1.30; 15 min: 1.43 vs. 1.28; 30 min: 1.44 vs. 1.28; 1 hr: 1.47 vs. 1.28; 2 hrs: 1.53 vs. 1.34; 3 hrs: 1.53 vs. 1.35; 4 hrs: 1.52 vs. 1.35; 6 hrs: 1.48 vs. 1.33; 8 hrs: 1.47 vs. 1.33; 10 hrs: 1.47 vs. 1.32; 12 hrs: 1.45 vs. 1.31; 23 hrs 15 min: 1.37 vs. 1.27; 23 hrs 45 min: 1.39 vs. 1.31; $p<0.001$ for all time points.

References: 1. SEEBRI® BREEZHALER® Product Monograph. Novartis Pharmaceuticals Canada Inc., December 3, 2013. **2.** Kerwin E, Hébert J, Gallagher N *et al.* Efficacy and safety of NVA237 versus placebo and tiotropium in patients with COPD: the GLOW2 study. *Eur Respir J* 2012;40:1106-14. **3.** D'Urzo A, Ferguson GT, van Noord JA *et al.* Efficacy and safety of once-daily NVA237 in patients with moderate-to-severe COPD: the GLOW1 trial. *Respir Res* 2011;12(156):1-13. **4.** Data on file. Novartis Pharmaceuticals Canada Inc. **5.** Jones P. St. George's Respiratory Questionnaire Manual. Available from: www.healthstatus.sgul.ac.uk/SGRQ_download/SGRQ%20Manual%20June%202009.pdf. Accessed May 16, 2014.

NOVARTIS PHARMACEUTICALS

Novartis Pharmaceuticals Canada Inc.
Dorval, Québec H9S 1A9
www.novartis.ca
514.631.6775 514.631.1867

14SEE033E

PAAB Member R&D

Once Daily
Pr seebri® breezhaler®
Glycopyrronium inhalation powder