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. 4, FALL 2015

VOLUME 20, Nº 4, AUTOMNE 2015

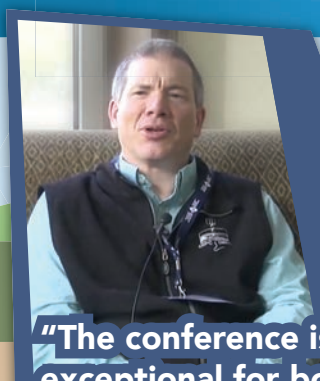
IN THIS ISSUE

DANS CE NUMÉRO

RURAL & REMOTE 2016

THE SOCIETY OF RURAL PHYSICIANS OF CANADA'S 24th ANNUAL RURAL AND REMOTE MEDICINE COURSE

~ May 5th to 7th 2016 ~



"The conference is exceptional for both its educational programming and social events."
Dr. John Soles, SRPC President

"Amazing... its a conference for everybody."
Laura, 3rd year at Memorial University

"Good conference - paid for when I was resident... Learned about it and have enjoyed every conference I've attended since!

"I think the Rural and Remote conference is just amazing."

Earlybird Registration Deadline December 1st 2015

www.srpc.ca/rr2016

Fairmont Le Manoir Richelieu

Charlevoix, Québec

Email: registration@srpc.ca
Register online: www.srpc.ca/rr2016

Society of Rural Physicians of Canada
Société de la Médecine Rurale du Canada

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; manedcjrm@gmail.com

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

Printed on acid-free paper from inception.

Canadian Journal of Rural Medicine
Journal canadien de la médecine rurale

VOL. 20, NO. 4, FALL / AUTOMNE 2015

EDITORIALS / ÉDITORIAUX

ORIGINAL ARTICLES / ARTICLES ORIGINAUX

JOINT POSITION PAPER / DÉCLARATION DE PRINCIPE COMMUNE

THE PRACTITIONER / LE PRATICIEN

RESIDENTS' CORNER / COIN DES RÉSIDENTS

Our Lives are in the Land
Acrylic on canvas, 48" × 60", by Christi Belcourt
© 2014
www.christibelcourt.com; @christibelcourt
"The plants are teachers. They are connected to each other, and all other spiritual beings through the sacredness of life. And when I remember this, I remember to respect even the smallest of things."

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
Carole Lalonde, Sarah O'Neill, Clara Walker
Online Publishing
Publication en direct
Marla Fletcher, 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

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

Plastics Techniques for the Rural/ Emergency Physician
Dec. 8–9, 2015
Montréal, Que.

Slit Lamp/Eye Injury for the Rural/ Emergency Physician
Dec. 10, 2015
Montréal, Que.

CME for Enhanced Surgical Skills for Rural Physicians
Jan. 21–22, 2016
Banff, Alta.

Rural and Remote 2016
May 5–7, 2016
Charlevoix, Que., at the Manoir Richelieu

Plastics Techniques for the Rural Emergency Physician
Jan. 21, 2016, Banff, Alta.

Rural surgery networks: need for a home

Stuart Iglesias, MD
Bella Bella, BC

Jude Kornelsen, PhD
Salt Spring Island, BC

Robert Woollard, MD
Vancouver, BC

Keith MacLellan, MD
Shawville, Que.

Correspondence to:
Stuart Iglesias;
siglesias64@gmail.com

The "Joint Position Paper on Rural Surgery and Operative Delivery" (page 129), endorsed by The College of Family Physicians of Canada (CFPC), the Society of Obstetricians and Gynaecologists of Canada (SOGC), the Canadian Association of General Surgeons (CAGS), and the Society of Rural Physicians of Canada (SRPC), represents a milestone, possibly a cornerstone, in rural generalism. It recognizes and validates the platform of cross-training among 3 or more professional disciplines, across both primary and secondary care, that has historically sustained rural health care. Its overarching recommendation is for networks of surgical and maternity care among obstetricians, general surgeons and family physicians with enhanced surgical skills.

The next step in the translation of these recommendations is to build demonstration networks complete with rigorous evaluations that measure these networks' impact on the volume and distribution of surgical care. These evaluations should include benchmarks such as surgical wait times, outcomes of surgical care, and patient and provider satisfaction with that care.

There is no blueprint for building a rural surgical care network. We are fully aware that the specialist workforce in rural Canada has a wary skepticism about these proposals. Specifically, they wonder where the funding and the outcome measurements will be found.

There are no easy answers. More than 2 decades have failed to stop the attrition of services to rural Canadians. A 5 pillar national strategy (put forth by the Networking Group, an eclectic volunteer group of stakeholders working with the national organizations, but outside of approved structures), of which the joint position paper is a keystone, is gaining momentum, but will only be achieved with concerted effort on the part of all stakeholders — including our medical colleges.

It is clear that the present institutional landscape has been a hindrance rather than an asset in the historical struggles to successfully address the needs of rural communities for surgery and operative delivery. There are encouraging new efforts. The CAGS has struck a rural committee. The CFPC has endorsed a Certificate of Added Competence for enhanced surgical skills. The Royal College of Physicians and Surgeons of Canada (RCPSC) has taken an active interest in the joint position paper. The existing educational, credentialling, accreditation and regulatory bodies have been unable to act effectively to provide rural Canadians with the best access possible to specialized services. What is needed is a specific rural health focus on many levels — political, bureaucratic and medical. If the focus cannot be provided by the current structures, then a new structure surely will be created, and soon.

There is an urgent need for some original thinking for the heavy lifting needed to carry the joint position paper forward. Will the CFPC, RCPSC, CAGS, SOGC and others take the lead with the SRPC in formulating an implementation strategy, perhaps by piloting demonstration networks for rural surgery?

If not us, who? If not now, when?

Réseaux de soins chirurgicaux en milieu rural : une nécessité

Stuart Iglesias, MD
Bella Bella (C.-B.)

Jude Kornelsen, PhD
Salt Spring Island (C.-B.)

Robert Woollard, MD
Vancouver (C.-B.)

Keith MacLellan, MD
Shawville (Qc)

Correspondance :
Stuart Iglesias; siglesias64@gmail.com

Le document « Joint Position Paper on Rural Surgery and Operative Delivery » (déclaration de principe commune sur les soins chirurgicaux et les accouchements opératoires en milieu rural) (page 129), approuvé par le Collège des médecins de famille du Canada (CMFC), la Société des obstétriciens et gynécologues du Canada (SOGC), l'Association canadienne des chirurgiens généraux (ACCG) et la Société de la médecine rurale du Canada (SMRC), représente une étape importante, voire cruciale, dans le domaine de la médecine générale en milieu rural. Il reconnaît et valide le programme de formation croisée entre 3 disciplines professionnelles ou plus, tant dans les soins primaires que dans les soins secondaires, qui assure depuis longtemps la viabilité des soins de santé en milieu rural. La principale recommandation qui en ressort concerne l'établissement de réseaux de soins chirurgicaux et de soins de maternité parmi les obstétriciens, les chirurgiens généralistes et les médecins de famille possédant des compétences avancées en chirurgie.

Afin de mettre en œuvre ces recommandations, il faudra d'abord créer des projets pilotes prévoyant des évaluations rigoureuses visant à mesurer l'impact de tels réseaux sur le volume et la répartition des soins chirurgicaux. Ces évaluations devraient comprendre des paramètres de référence comme le temps d'attente pour une intervention chirurgicale, les résultats des soins chirurgicaux et le niveau de satisfaction des patient et des fournisseurs de soins.

Il n'existe aucun modèle tout fait pour la création d'un réseau de soins chirurgicaux en milieu rural. Nous sommes parfaitement conscients du fait que les spécialistes des régions rurales du Canada sont sceptiques et méfiants à l'égard de ces propositions. Plus précisément, ils s'interrogent sur la façon dont le financement et les mesures des résultats seront obtenus.

Il n'y a pas de réponse facile. Plus de 20 années d'efforts n'auront pas suffi à freiner la dégradation des services offerts aux Canadiens des régions rurales. Une stratégie nationale à 5 volets (mise de l'avant par le *Networking Group*, un groupe éclectique bénévole constitué d'intervenants travaillant auprès des organisations nationales, mais en dehors des structures approuvées) dont la déclaration de principe commune constitue la clef de voûte, s'impose de plus en plus, mais elle ne pourra être mise en œuvre qu'avec un effort concerté de la part de tous les intervenants, y compris nos facultés de médecine.

Il est clair que le paysage institutionnel actuel a été un obstacle plutôt qu'un atout dans les efforts de longue date visant à répondre adéquatement aux besoins des communautés rurales en matière de soins chirurgicaux et d'accouchements opératoires. De nouveaux efforts encourageants ont été déployés. L'ACCG a créé un comité rural. Le CMFC a appuyé l'octroi d'un Certificat de compétence additionnelle pour les compétences avancées en chirurgie. Le Collège royal des médecins et chirurgiens du Canada

(CRMCC) s'est intéressé de très près à la déclaration de principe commune. Les organismes d'éducation, d'accréditation et de réglementation existants ont été incapables d'agir efficacement pour fournir aux Canadiens des régions rurales le meilleur accès possible aux services spécialisés. Ce qu'il faut, c'est mettre l'accent sur la santé en milieu rural de façon spécifique à différents niveaux : politique, bureaucratique et médical. S'il est impossible de faire converger l'attention sur cet enjeu avec les structures actuelles, alors une nouvelle structure sera certainement mise en place sous peu.

Nous avons un besoin urgent d'idées audacieuses pour parvenir à faire progresser la déclaration de principe commune, ce qui ne sera pas chose facile. Le CMFC, le CRMCC, l'ACCG, la SOGC et d'autres prendront-ils les devants avec la SMRC pour formuler une stratégie de mise en œuvre, peut-être en mettant à l'essai des modèles de réseaux de soins chirurgicaux en milieu rural?

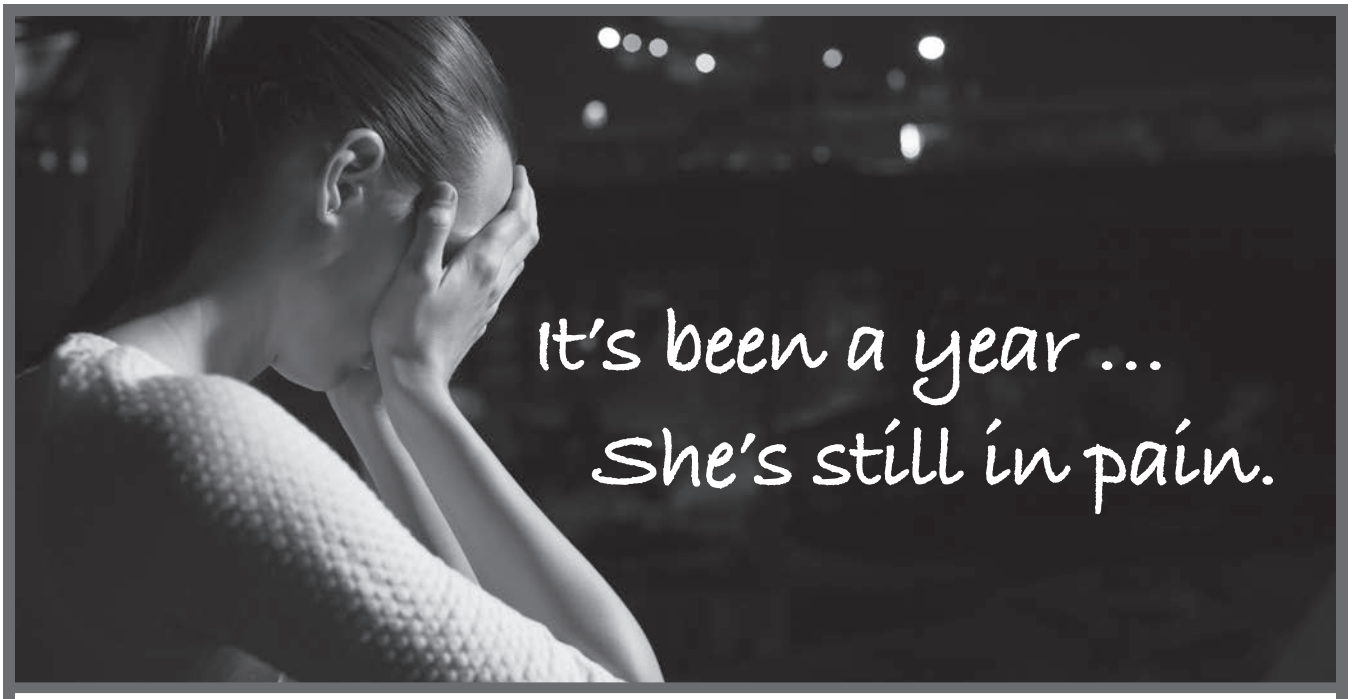
Si nous ne le faisons pas, qui le fera? Si nous ne le faisons pas maintenant, quand le ferons-nous?

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



ADDRESSING PAST SEXUAL ASSAULT IN CLINICAL SETTINGS

This free and interactive online curriculum focuses on:

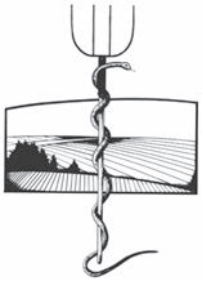
- the long-term physical, psychological and social impacts of sexual assault
- creating an environment that supports disclosures
- appropriately responding to a woman who has been sexually assaulted in the past
- fostering an interdisciplinary and collaborative approach within your practice setting

To explore and learn, visit
www.DVeducation.ca/sexualassault

WCHRI
WOMEN'S COLLEGE RESEARCH INSTITUTE
Health care for women | REVOLUTIONIZED

Funded by:

Ontario
Ontario Women's Directorate



President's message. Fear, safety and scope of practice

John Soles, MD, FRRMS
Clearwater, BC

Correspondence to:
John Soles;
johnasoles@gmail.com

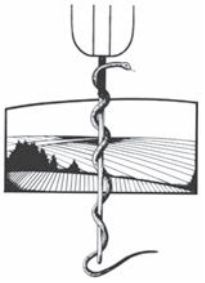
There have been several well-publicized cases recently of children being apprehended by social welfare services, or their parents being charged because the children walked to school unaccompanied or played in a park without a responsible adult present. This reduction in the free roaming of children over the past decades seems related to concerns about safety. I suspect my childhood experiences of boating, swimming and even hitchhiking with siblings, but no adults, before I was in high school might now prompt a visit from social services. Why is it that as the lives of Canadians become safer than they have ever been, as crime rates have dropped rapidly, and life expectancy and other health indicators have continued to improve, we have become increasingly concerned about safety?

It seems clear that our perception of risk is not a reflection of reality. Examples of where our non–evidence-based fears have led us include legislation that sacrifices some of our freedom of speech and privacy to "protect" us from terrorism, punitive approaches to drug use and addiction, and the return of vaccine-preventable disease to Canada.

Our profession has not been immune to the rise of safety concerns. Students, residents and newly practising physicians often express their fear about the situations that they may find themselves in (commonly the emergency department or the delivery room). Their fear leads to an increased perception of risk and concerns about safety that often are not supported by evidence and may lead these physicians to limit their scope of practice to that with which they feel comfortable. This process can be aggravated by the attempts of regulatory bodies to achieve perfect safety, and by the inability of training programs (or the unwillingness of preceptors) to train physicians to the fullest and widest possible scope of practice. An example is a resident of mine who, while working in a city emergency department, was told that she didn't need to know how to reduce a dislocated shoulder because she was just going to be a family doctor.

Programs, such as British Columbia's Privileging Project, have the potential to aggravate concerns about safety that are unsupported by evidence, leading to the potential for reductions of rural physicians' scope of practice and limiting services to rural Canadians. The "Joint Position Paper on Rural Surgery and Operative Delivery" (page 129) shows a more appropriate approach to fears about medical safety. We need to use evidence to support procedures that are safe and effective in rural communities. We need to train rural physicians to deliver this care, support them in the communities to which they go (throughout the duration of their careers), give them the opportunity to improve their skills and learn new ones, and use rigorous quality improvement to ensure safety.

What are we afraid of?



Message du président. Peur, sécurité et champ de pratique

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

Correspondance :
John Soles;
johnasoles@gmail.com

On a entendu parler récemment de plusieurs cas très médiatisés d'enfants appréhendés par les services de protection de l'enfance ou de parents accusés de négligence parce que leurs enfants se rendaient à l'école non accompagnés ou jouaient dans un parc sans la présence d'un adulte responsable. Des préoccupations à l'égard de la sécurité semblent être en cause dans cette limitation de la libre circulation des enfants observée au cours des dernières décennies. J'ai bien l'impression que les expériences de mon enfance comme se promener en bateau, se baigner et même faire de l'auto-stop avec un frère ou une sœur, mais sans adulte, avant l'école secondaire, pourraient maintenant donner lieu à une visite des services sociaux. Pourquoi nous préoccupons-nous de plus en plus de la sécurité alors que nos vies sont de plus en plus sûres, que les taux de criminalité ont chuté rapidement et que l'espérance de vie et autres indicateurs de santé continuent de s'améliorer?

De toute évidence, notre perception du risque ne reflète pas la réalité. Parmi les exemples de situations où nos craintes non fondées nous ont conduits, citons les lois qui sacrifient une partie de notre liberté d'expression et de notre vie privée pour nous « protéger » contre le terrorisme, l'approche punitive adoptée face à la consommation de drogues et la toxicomanie, et le retour de maladies évitables par la vaccination au Canada.

Notre profession n'a pas été à l'abri de la hausse des préoccupations à l'égard de la sécurité. Les étudiants, les médecins résidents et les nouveaux médecins expriment souvent leur peur de se retrouver dans certaines situations (le plus souvent, à l'urgence ou dans la salle d'accouchement). Leurs craintes donnent lieu à une perception accrue du risque et à des préoccupations en matière de sécurité qui, souvent, ne sont pas étayées par les preuves et peuvent faire en sorte que ces médecins limitent leur champ de pratique aux domaines avec lesquels ils se sentent à l'aise. Les tentatives des organismes de réglementation qui cherchent à atteindre la sécurité parfaite et l'incapacité des programmes de formation (ou l'absence de volonté des précepteurs) à donner aux médecins une formation menant au champ de pratique le plus complet et vaste possible peuvent empirer ce cycle de pensée. Par exemple, une de mes résidentes s'est fait dire — alors qu'elle travaillait dans un service d'urgence en milieu urbain —, qu'il n'était pas nécessaire qu'elle sache comment réduire une luxation d'épaule parce qu'elle allait juste être médecin de famille.

Certains programmes, tels que le projet *Privileging* de la Colombie-Britannique, peuvent amplifier les préoccupations de sécurité qui ne sont pas appuyées par des preuves, ce qui en retour peut donner lieu à une réduction de l'étendue de la pratique des médecins ruraux et des services aux Canadiens dans les régions rurales. Le document « Joint Position Paper on Rural Surgery and Operative Delivery » (déclaration de principe commune sur les soins chirurgicaux et les accouchements opératoires en milieu rural) (page 129) présente une approche plus appropriée face aux craintes concernant la sécurité médicale. Nous devons utiliser des éléments de preuve pour appuyer les interventions qui sont sûres et efficaces dans les communautés rurales. Nous devons former les médecins ruraux pour qu'ils puissent offrir ces soins, les soutenir dans les communautés où ils s'établissent (pendant toute la durée de leur carrière), leur donner la possibilité d'améliorer leurs compétences et d'en acquérir de nouvelles, et utiliser une démarche rigoureuse d'amélioration de la qualité pour assurer la sécurité.

De quoi avons-nous peur?

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

Original Article
Article original

Clostridium difficile infection in rural Ontario: a retrospective multisite population-based study

Ken Babey, MD, FRRM
Department of Family Medicine, McMaster University, Mount Forest, Ont.

Stephen Kelton, MSc
Medical University of the Americas, Charlestown, Nevis, West Indies

William K. Milne, MD, CCFP(EM), FCFP
Department of Family Medicine, Western University, Exeter, Ont.

Jill Muileboom
Brenda Voth, MLT
Len Kelly, MD, MClin Sci, FCFP, FRRM
Sioux Lookout Meno Ya Win Health Centre, Sioux Lookout, Ont.

William C. Brintnell, PhD
Tammy Dickins
Callie Armitage
South Huron Hospital Association, Exeter, Ont.

Correspondence to:
Len Kelly; lkelly@univmail.cis.mcmaster.ca

This article has been peer reviewed.

Introduction: We conducted a retrospective, population-based study to assess the prevalence of *Clostridium difficile* infections and the associated risk factors among inpatients and outpatients in our region.
Methods: We used laboratory data over a 2-year period to identify inpatient and outpatient cases of *C. difficile* infection. Data were collected from 3 local catchment areas for rural hospital laboratories in Sioux Lookout, Mount Forest and the South Huron Hospital Association in Exeter. We gathered demographic data and infection-specific information, including recent antibiotic use and recent or current hospital admission or nursing home stay.
Results: During the study period, 34 cases of *C. difficile* infection occurred in 29 patients, with an estimated crude annual rate of 24.3/100 000 population. Of the cases, 47.1% were diagnosed in outpatients. Most patients (76.5%) had taken antibiotics within the previous 90 days, and antibiotic use and hospital admission accounted for 47.1% of cases. Clindamycin was more commonly associated with *C. difficile* infections at the northern site and ciprofloxacin at the southern sites. There were 2 deaths from comorbidities.
Conclusion: The estimated annual incidence of *C. difficile* infection in our study is similar to urban-based estimates. Almost half of the cases involved outpatients, indicating a need to recognize this illness as a serious outpatient condition. Antibiotic stewardship is an ongoing consideration, as most patients were exposed to antibiotic use before infection.

Introduction : Nous avons effectué une étude rétrospective basée dans la population pour évaluer la prévalence des infections à *Clostridium difficile* et les facteurs associés chez les patients hospitalisés et non hospitalisés de notre région.
Méthodes : Nous avons utilisé les données de laboratoire sur une période de 2 ans pour recenser les cas d'infections à *C. difficile* chez les patients hospitalisés et non hospitalisés. Les données ont été recueillies à partir de 3 bassins de population locaux pour les laboratoires hospitaliers ruraux de Sioux Lookout, de Mount Forest et de la South Huron Hospital Association à Exeter. Nous avons colligé les données démographiques et les renseignements spécifiques aux infections, y compris l'utilisation récente de l'antibiothérapie et les hospitalisations ou séjours en foyers de soins infirmiers récents ou en cours.
Résultats : Au cours de la période de l'étude, 34 infections à *C. difficile* ont été dénombrées chez 29 patients, pour un taux annuel brut estimé de 24,3/100 000 habitants. Parmi ces cas, 47,1 % n'étaient pas hospitalisés au moment du diagnostic. La plupart des patients (76,5 %) avaient pris des antibiotiques au cours des 90 jours précédents et l'antibiothérapie et l'hospitalisation caractérisaient 47,1 % des cas. La clindamycine a le plus souvent été associée aux infections à *C. difficile* dans le site le plus au Nord et la ciprofloxacine, dans les deux sites plus au Sud. On a déploré 2 décès par suite de comorbidités.
Conclusion : L'incidence annuelle estimée de l'infection à *C. difficile* au cours de notre étude a été similaire aux estimations obtenues en milieu urbain. Près de la moitié des cas s'observaient chez des patients non hospitalisés, rappelant la nécessité de considérer cette infection comme un grave problème de santé chez les patients externes. La bonne gestion de l'utilisation des antibiotiques demeure un enjeu constant puisque la plupart des patients avaient été exposés à des antibiotiques avant leur infection.

INTRODUCTION

Clostridium difficile infections as a cause of symptomatic diarrhea and colitis are reported in the literature to be on the rise.[1] Until relatively recently,[2] most published data consisted of reportable infections in hospital inpatients, whereas infections that were acquired in the community and treated on an outpatient basis went uncounted. In 2014, studies in Manitoba and Australia documented that about 40% of *C. difficile* infections were community-associated.[1,2] Data are lacking on estimates of *C. difficile* infections among inpatient and outpatient populations in rural Canada.

In northwestern Ontario, high rates of antibiotic-resistant bacterial illness, including invasive disease, that are sensitive to clindamycin have been identified.[3–5] Antibiotic use (and overuse) is a known risk factor for *C. difficile* infections. We conducted a retrospective, population-based study to assess the prevalence of *C. difficile* infections and the associated risk factors among inpatients and outpatients in our region. To add to the total number of cases and to compare our rates with those of other rural regions in the province, we enlisted researchers in 2 rural centres in southern Ontario.

METHODS

We collected laboratory data for positive *C. difficile* test results for inpatients and outpatients over a 2-year period, from Apr. 1, 2012, to Apr. 1, 2014, from 3 sites in rural Ontario: Sioux Lookout, Mount Forest and the South Huron Hospital Association in Exeter. In-house *C. difficile* toxin tests and Public Health Ontario laboratory test results were collated. The catchment area populations for the 3 rural hospital laboratories were estimated from regional strategic plans.

We gathered demographic data and infection-specific information, including recent antibiotic use, and recent or present hospital admission or nursing home stay. Hospital-associated cases were defined by onset of symptoms and positive testing more than 48 hours after admission. Community-associated cases were defined by no hospital admission or by onset of symptoms and positive testing within 48 hours of a hospital admission. We defined recurrence by a positive specimen result 2–8 weeks after previous positive testing. Positive results beyond 8 weeks were considered a new case.

The Sioux Lookout Research Review and Ethics Committee granted ethics approval for this study.

RESULTS

The 3 rural laboratory sites had a total estimated population of 70 000 in the catchment areas (Table 1). A total of 34 cases (in 29 patients) of *C. difficile* infection were encountered during the study period (Table 2). This is an estimated crude annual rate of 24.3/100 000 population. These cases included both inpatients and outpatients. The northern site (Sioux Lookout) had the same number of cases as the 2 southern sites (Mount Forest and South Huron Hospital Association) combined; taking into account the populations (29 000 for the northern site v. 41 000 for the southern sites combined) the difference in rates of *C. difficile* infection was not significant ($p = 0.6$).

Most *C. difficile* infections were new cases (78.8%) and 7 were recurrences. The mean age was 61.7 (range 2–93) years, with one outlier at 2 years of age (Table 2). Of the patients, 76% were older than 50 years, and 50% were older than 65 years. Outpatient diagnosis occurred 47.1% of the time (Table 2) and outpatient treatment occurred 41.2% of the time (Table 3).

Most patients (76.5%) had taken an antibiotic within 90 days of their diagnosis. Antibiotic use and

Table 1: Estimated population service areas for laboratory services*

Service area	Population catchment area for laboratory services
Sioux Lookout	29 000
South Huron Hospital Association, Exeter	19 000
Mount Forest	22 000
Total	70 000

*The estimates came from Statistics Canada and internal hospital audits, according to which communities the laboratory served and/or from internal strategic planning documents developed by each laboratory service.

Table 2: Patient characteristics at presentation, *n* = 34 infections

Characteristic	No. (%)*
Age, mean (range), yr	61.7 (2–93)
New cases	26 (76.5)
Recurrent cases	7 (20.6)
Diagnosed in outpatient	16 (47.1)
Diagnosed in inpatient	17 (50.0)
Days of diarrhea before diagnosis	
Mean (range)	11.7 (1–40)
1–3	6 (17.6)
1–7	13 (38.2)

*Unless stated otherwise.

hospital admission accounted for 47.1% of cases. Only a small portion of our identified cases had no hospital admission or antibiotic use (14.7%). Of the patients, 38.2% were concurrently taking proton pump inhibitors (PPIs) (Table 4).

The associated antibiotics used within 90 days of case detection was almost evenly distributed: ciprofloxacin (26.5%), clindamycin (23.5%) and cephalosporins (20.6%). Clindamycin was more commonly associated with *C. difficile* infections at the northern site and ciprofloxacin at the southern sites (Table 5). Treatment was commonly metronidazole (64.7%) (Table 3).

There were 2 deaths, both in older, immunocompromised patients with other infections and end-stage renal disease or cancer.

DISCUSSION

Our population-based incidence is similar to those quoted in urban-based North American studies, which commonly quote a rate of 20–30/100 000 population.[6] Outpatients amounted to almost half of the total cases in our study, which is also in keeping with recent estimates for urban populations. A 2006 Manitoba study of 1006 cases of *C. difficile* infection found a similar rate in their provincial population data of 23.4/100 000 and a 40% outpatient incidence.[2,6]

Advanced age is a known risk factor for *C. difficile* infection.[7,8] Our study supports this, with a mean age of 61.7 years and half of the patients being older than 65 years.

Antibiotic use has long been considered a risk factor for *C. difficile* infection, and our study does nothing to challenge that assumption. In more than three-quarters of cases, an antibiotic had been used within the previous 90 days. We did find that clindamycin use in the northern site was more commonly associated with *C. difficile* infection than at the other sites. This may represent a prescribing difference, with clindamycin being prescribed more commonly at the northern location. Recently, higher rates of community-associated methicillin-resistant *Staphylococcus aureus* have occurred in that region, including serious invasive bacteremias. Clindamycin is 1 of 3 possible early treatments (along with sulfamethoxazole–trimethoprim and doxycycline), and this finding may reflect an increased use of this antibiotic relative to other rural sites in the province.[3–5]

In the 1970s, clindamycin was commonly associated with *C. difficile* infection and its usage declined as a result. In the 1980 and 1990s, cephalosporins were the commonly identified culprit. More recently,[9] fluoroquinolones have been associated with *C. difficile* infection (including the 2002/03 Quebec outbreak of a highly virulent strain).[10] We see all 3 offending antimicrobials in equal numbers in our study.

Proton pump inhibitors are statistically associated with increased rates of *C. difficile* infection in large US and UK population studies.[11–15] Although this is still controversial, the US Food and Drug Administration has issued a warning to patients taking long-term PPI therapy about an increased risk of *C. difficile* infection. A 2013 Scottish study calculated a 1.7-fold increase in risk of *C. difficile* infection with chronic PPI use.[16] The proposed mechanism is the protective effect of normal stomach acidity and the change in stomach and large

Table 3: Treatment of *Clostridium difficile* infection, *n* = 34 infections

Variable	No. (%)
Medication	
Metronidazole	22 (64.7)
Vancomycin	4 (11.8)
Vancomycin and metronidazole	4 (11.8)
Data unavailable	4 (11.8)
Patient status at time of treatment	
Outpatient	14 (41.2)
Inpatient	17 (50.0)
Data unavailable	3 (8.8)

Table 4: Exposures before *Clostridium difficile* infection, *n* = 34 infections

Preinfection exposure	No. (%)
Antibiotic use within 90 d	26 (76.5)
Recent hospital admission plus antibiotic use	16 (47.1)
Outpatient antibiotic use	10 (29.4)
Outpatient status, with or without antibiotic use	15 (44.1)
Antibiotic use within 90 d in 26 new cases	18/26 (69.2)
Hospital admission, without antibiotic use	2 (5.9)
No hospital admission or antibiotic use	5 (14.7)
Recent PPI use	13 (38.2)

PPI = proton pump inhibitor.

Table 5: Antibiotic use within 90 days of diagnosis of *Clostridium difficile* infection, *n* = 34 infections

Antibiotic	No. (%)
Ciprofloxacin*	9 (26.5)
Clindamycin*	8 (23.5)
Cephalosporin*	7 (20.6)
Penicillin, amoxicillin	3 (8.8)
Other	8 (23.5)
Data unavailable	9 (26.5)

*Ciprofloxacin: 6/9 cases were at southern sites; clindamycin: all cases were at the northern site; cephalosporin: cases at northern and southern sites.

intestine flora by PPIs.[17–19] Our study sheds no light on this developing discussion, as PPIs were used in 38.2% of cases, but most of these patients had also received antibiotics (11/13).

Given that outpatient diagnosis and treatment often occur in office practice settings, it is sobering to know that recent studies indicate that spore shedding can occur up to 4 weeks after treatment initiation and can inhabit any skin location and high contact environmental areas, such as door handles and examination tables.[20,21] Attention to hand washing and hand protection, and use of sporicidal-containing cleansers may be warranted in attending to affected patients in our office settings.

Limitations

Our catchment-area populations were estimates from regional service planning sources. These are not directly comparable to province-wide census population figures. Our methods were similar to those of other population-based studies that also used laboratory-based catchment areas as a starting point. Cases were identified if their tests were processed in the identified laboratory. We did not cross-check those cases with home addresses, so we may have included some visitors to the community in our case detection. Because we were able to access most inpatient records from the hospital associated with the laboratory, this effect may be minimal. Alternatively, patients from 1 of our 3 catchment areas may have been tested elsewhere, and we would have missed those cases. Our rates of *C. difficile* infection are therefore considered estimated crude rates.

CONCLUSION

The estimated annual incidence of *C. difficile* infection is similar to other existing urban population-based figures. The northern rural site in the study had a higher incidence than the 2 southern sites, which was not significant. Most cases were associated with antibiotic use. Antibiotic stewardship is an important consideration in our communities.

Almost half of the identified cases of *C. difficile* infection involved outpatients. Although we have traditionally viewed *C. difficile* infection as a hospital-acquired infection, this is no longer accurate. Care will have to be taken with hygiene in our office examination rooms and other outpatient clinic settings.

Competing interests: None declared.

REFERENCES

1. Slimmings C, Armstrong P, Beckingham W, et al. Increasing incidence of *Clostridium difficile* infection, Australia, 2011–12. *MJA* 2104;200:272-6.
2. Lambert PJ, Dyck M, Thompson LH, et al. Population-based surveillance of *Clostridium difficile* infection in Manitoba, Canada, by using interim surveillance definitions. *Infect Control Hosp Epidemiol* 2009;30:945-51.
3. Muileboom J, Hamilton M, Kelly L. The changing face of cellulitis and MRSA in rural Canada: a clinical update. *Can J Rural Med* 2013;18:137-9.
4. Muileboom J, Hamilton M, Parent K, et al. Community-associated methicillin-resistant *Staphyloccus aureus* in northwest Ontario: a five-year report of incidence and antibiotic resistance. *Can J Infect Dis Med Microbiol* 2013;24:e42-4.
5. Kirlew M, Rea S, Muileboom J, et al. Invasive community-associated methicillin-resistant *Staphyloccus aureus*: a two year prospective study. *Can J Rural Med* 2014;19:99-102.
6. Gupta A, Khanna S. Community-acquired *Clostridium difficile* infection: an increasing public health threat. *Infect Drug Resist* 2014;7:63-72.
7. McFarland L. Update on the changing epidemiology of *Clostridium difficile*-associated disease. *Nat Clin Pract Gastroenterol Hepatol* 2008;5:40-8.
8. Freeberg D, Salmasian H, Friedman C, et al. Proton pump inhibitors and risk for recurrent *Clostridium difficile* infection among inpatients. *Am J Gastroenterol* 2013;108:1794-801.
9. Gerding D. Clindamycin, cephalosporins, flouroquinolones and *Clostridium difficile* associated diarrhea: This is an antimicrobial resistance problem. *Clin Infect Dis* 2004;38:646-8.
10. Pepin J, Saheb N, Coulombe M, et al. Emergence of fluoroquinolones as the predominant risk factor for *Clostridium difficile* associated diarrhea: a cohort study during an epidemic in Quebec. *Clin Infect Dis* 2005;41:1254-60.
11. Freedberg DE, Abrams JA. *Clostridium difficile* infection in the community: Are proton pump inhibitors to blame? *World J Gastroenterol* 2013;19:6710-3.
12. Dial S, Delaney JA, Barkun AN, et al. Use of gastric acid-suppressive agents and the risk of community-acquired *Clostridium difficile*-associated disease. *JAMA* 2005;294:2989-95.
13. Jacobson BC, Ferris TG, Shea TL, et al. Who is using chronic acid suppression therapy and why? *Am J Gastroenterol* 2003;98:51-8.
14. Janarthanan S, Ditah I, Adler DG, et al. *Clostridium difficile*-associated diarrhea and proton pump inhibitor therapy: a meta-analysis. *Am J Gastroenterol* 2012;107:1001-10.
15. Kwok CS, Arthur AK, Anibueze CI, et al. Risk of *Clostridium difficile* infection with acid suppressing drugs and antibiotics: meta-analysis. *Am J Gastroenterol* 2012;107:1011-9.
16. Marwick CA, Yu N, Lockhart MC, et al. Community-associated *Clostridium difficile* infection among older people in Tayside, Scotland, is associated with antibiotic exposure and care home residence: cohort study with nested case-control. *J Antimicrob Chemother* 2013; 68:2927-33.
17. Rao A, Jump RL, Pultz NJ, et al. In vitro killing of nosocomial pathogens by acid and acidified nitrite. *Antimicrob Agents Chemother* 2006;50:3901-4.
18. Wilson KH, Sheagren JN, Freter R. Population dynamics of ingested *Clostridium difficile* in the gastrointestinal tract of the Syrian hamster. *J Infect Dis* 1985;151:355-61.
19. Williams C. Occurrence and significance of gastric colonization during acid-inhibitory therapy. *Best Pract Res Clin Gastroenterol* 2001;15:511-21.
20. Jury L, Sitzlar B, Kundrapu S, et al. Outpatient healthcare settings and transmission of *Clostridium difficile*. *PLoS One* 2013;8: e70175.
21. Sethi A, Al-Nissir W, Nerandzie M, et al. Persistence of skin contamination and environmental shedding of *Clostridium difficile* during and after treatment of *C. difficile* infection. *Infect Control Hosp Epidemiol* 2010;31:21-7.

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

Original Article
Article original

Influence of parental education on Honduran medical students' labour perspectives: rural work and emigration

Lysien I. Zambrano, MD
Department of Morphological Sciences, Faculty of Medical Sciences, Universidad Nacional Autónoma de Honduras, Tegucigalpa, Honduras

Reneé Pereyra-Elías, MD
School of Medicine, Universidad Peruana de Ciencias Aplicadas, Lima, Peru

Selvin Z. Reyes-García, MD
Department of Morphological Sciences, Faculty of Medical Sciences, Universidad Nacional Autónoma de Honduras, Tegucigalpa, Honduras

Itzel Fuentes, MD
Department of Obstetrics and Gynecology, Hospital Escuela Universitario, Tegucigalpa, Honduras

Percy Mayta-Tristán, MD, MSc
School of Medicine, Universidad Peruana de Ciencias Aplicadas, Lima, Peru

Correspondence to: Percy Mayta-Tristán; percy.mayta@upc.edu.pe

This article has been peer reviewed.

Introduction: We sought to evaluate the intentions of Honduran medical students to emigrate or to work in a rural setting, and their association with parental education.

Methods: We performed a cross-sectional, analytic study at a Honduran medical school. Student participants completed a structured questionnaire, which assessed their intentions to emigrate or work in a rural setting after finishing medical school and the highest level of education achieved by their parents. We calculated crude and adjusted prevalence ratios with their respective 95% confidence intervals.

Results: Of 868 surveys distributed, 564 were completed. The mean age of the participants was 21 (standard deviation 3) years, and 62.2% were female. Of the respondents, 16.6% intended to emigrate to work and 11.2% intended to work in a rural setting. Higher paternal education (i.e., technical, university and postgraduate training) was associated with a higher rate of intention to emigrate. Students whose fathers underwent postgraduate education were less likely to intend to work in a rural setting. For maternal education, only the postgraduate level was associated with the outcomes in some of the tested models.

Conclusion: The frequency of students intending to emigrate was relatively low. However, the frequency of students being willing to work in rural settings was also low. Students whose parents had higher levels of education were more likely to intend to work abroad and less likely to intend to work in a rural area. These factors should be considered in medical schools' selection processes to improve retention and ensure adequate distribution of physicians.

Introduction : Nous avons voulu évaluer les intentions d'étudiants en médecine honduriens d'émigrer ou de travailler en milieu rural et le rapport entre leurs intentions et le degré de scolarité de leurs parents.

Méthodes : Nous avons effectué une étude analytique transversale dans une faculté de médecine du Honduras. Les étudiants participants ont répondu à un questionnaire structuré qui évaluait leurs intentions d'émigrer ou de travailler en milieu rural à la fin de leurs études de médecine et le plus haut degré de scolarité atteint par leurs parents. Nous avons calculé les rapports de prévalence brute et ajustée, ainsi que leurs intervalles de confiance de 95 % respectifs.

Résultats : Sur les 868 questionnaires distribués, 564 ont été remplis. L'âge moyen des participants était de 21 ans (écart-type 3 ans) et 62,2 % étaient de sexe féminin. Parmi les répondants, 16,6 % avaient l'intention d'émigrer pour travailler et 11,2 % avaient l'intention de travailler en milieu rural. Un niveau de scolarité paternel plus élevé (c'est-à-dire, formation technique, universitaire ou études supérieures) était associé à un taux plus élevé d'intention d'émigrer. Les étudiants dont les pères avaient

fait des études supérieures étaient moins susceptibles d'avoir l'intention de travailler en milieu rural. En ce qui concerne l'éducation maternelle, seules les études supérieures ont été associées aux résultats pour certains modèles testés.

Conclusion : Le nombre d'étudiants ayant l'intention d'émigrer était relativement bas. Toutefois, le nombre d'étudiants acceptant de travailler en milieu rural était également bas. Les étudiants dont les parents avaient un niveau de scolarité plus élevé étaient plus susceptibles d'avoir l'intention de travailler à l'étranger et moins susceptibles d'avoir l'intention de travailler en milieu rural. Ces facteurs doivent entrer en ligne de compte lors du processus de sélection des étudiants admis dans les facultés de médecine pour améliorer la rétention et la distribution adéquate des effectifs médicaux.

INTRODUCTION

The current shortage and maldistribution of human resources for health constitutes a global problem and particularly affects developing countries.[1,2] This situation involves the well-documented occurrence of constant emigration of physicians (mostly from developing to developed nations)[3,4] and the unwillingness of physicians to work in rural and deprived settings in their countries of origin.[5,6] Thus, developing countries struggling to improve the health of their populations find themselves further from this goal.[7]

Several factors have been recognized that are associated with the intention of physicians and medical students to emigrate. Opportunities for further training and better labour and socioeconomic conditions are the main reasons physicians decide to emigrate.[8–10] In studies assessing the effect of having a rural background,[5,11] the variables that prevent physicians from working in a rural setting follow a similar pattern.[6,12]

Other research has indicated that family characteristics may influence the choice of remaining in the country of origin or working in a rural area. Studies have shown that students who do not have family members working in medicine and have less-educated parents are more likely to work in a rural area.[13,14] However, some findings are inconsistent.[15]

The Americas have also been affected by this human resources crisis,[1,3,16] and recent studies have reported high levels of intention to emigrate[17–19] and reluctance to work in rural areas.[17] However, data are lacking on the situation with the Honduran health workforce.[2,17]

The aim of the present study was to evaluate the intentions of Honduran medical students to emigrate or to work in a rural setting and their association with parental education.

METHODS

Study design and population

In 2008, only one medical school in Honduras, the Universidad Nacional Autónoma de Honduras (UNAH), had students in all years of training (from first to eighth year, according to the local curricula). The campus is located in Tegucigalpa, the capital of the country.

We conducted a cross-sectional, analytic study. During the first trimester of 2009, a convenience sample of medical students from the UNAH was invited to complete a survey. We excluded students in their seventh and eighth years because their corresponding internships and rural service activities take place in too many different health facilities across the country.

The authorities of the UNAH approved the study. Study participants gave verbal informed consent before their voluntary participation; Honduran law does not require written consent for observational studies. The provided data were anonymous and treated with complete confidentiality.

Survey

We used a questionnaire tested in a previous pilot study.[17] This self-administered survey assessed sociodemographic and migration information, academic factors, the presence of physicians in the family, parental influence on career choice, parental level of education, and variables regarding the labour perspectives of the participants. The students were located at their classrooms on the Tegucigalpa campus by members of the research team. They were consequently told about the objectives of the study and given the survey. The mean time taken to complete the survey was 15 (standard deviation [SD] 5) minutes.

Main variables

The students were asked direct questions about their intentions regarding emigration and working in a rural setting, framed 5 years after finishing medical school.

To evaluate parental education, the students were asked to specify the highest level of education reached by their mothers and fathers (i.e., high school or less, technical institute [non-university], university or postgraduate studies).

Statistical analysis

A database was generated in Microsoft Excel and then exported to Stata 11.0. We excluded surveys in which answers for the main variables were missing.

Categorical variables were described using relative and absolute frequencies, and numerical variables were described with their means and SDs. We performed a bivariate analysis using the χ^2 and Student *t* tests for categorical and numerical variables, respectively. We used Poisson regression with a robust error variance to evaluate factors associated with intentions to work abroad and in a rural setting at a multivariate level. We calculated crude and adjusted prevalence ratios with their corresponding 95% confidence intervals (CIs). Different models were tested. We considered $p < 0.05$ to be significant.

RESULTS

Of the 1346 UNAH students in their first to sixth years, 478 (35.5%) were not located. Of the 868 students who received the survey, 249 declined to take part in the study or returned the survey blank, and 55 did not complete the main variables. Of the 1346 eligible students, a total of 564 (41.9%) completed surveys that could be included in the analysis.

Participants' characteristics and labour perspectives

The mean age of the participants was 21 (SD 3) years, and 62.2% were female. Most of the students (95.4%) were single and did not have children (95.5%). Half of the participants (49.5%) migrated to Tegucigalpa for medical school. The characteristics of respondents are detailed in Table 1.

Of the respondents, 16.6% intended to emigrate to work and 11.2% intended to work in a rural setting. Figure 1 shows the frequencies of responses, by parental education.

There were no significant effects of sex, age, medical school year, and marital and parental status on intentions to emigrate or work in a rural setting. Students who did not migrate to Tegucigalpa to attend medical school were more likely to intend to emigrate. Having parents with an education level of high school or less was associated with a lower rate of intention to emigrate and a higher rate of intention to work in a rural area. Table 1 shows a detailed bivariate analysis addressing factors associated with the intention to emigrate or work in a rural setting.

Associated factors

In a multivariate analysis, higher paternal education was associated with a higher rate of intention to emigrate in all the models tested. The full models, including all variables, showed that technical (adjusted prevalence ratio 2.53 [95% CI 1.16–5.55]), university (adjusted prevalence ratio 2.39 [95% CI 1.08–5.30]) and postgraduate education (adjusted prevalence ratio 2.78 [95% CI 1.13–6.87]) remained associated with the intention to emigrate. However, for maternal education, only postgraduate-level education was associated with an increased intention to emigrate with adjustment for sex, age, year of study (adjusted prevalence ratio 2.24 [95% CI 1.27–3.96]) and for potential family influence on career choice (adjusted prevalence ratio 2.16 [95% CI 1.22–3.80]). Results for all models are summarized in Table 2.

Additionally, students whose fathers underwent postgraduate training were less likely to intend to work in a rural setting in the full model (adjusted prevalence ratio 0.13 [95% CI 0.03–0.55]). This association was significant for postgraduate maternal education in models adjusted for migration to attend medical school and English-language proficiency (adjusted prevalence ratio 0.20 [95% CI 0.05–0.87]) and family influence on career choice (adjusted prevalence ratio 0.21 [95% CI 0.05–0.85]) (Table 3).

DISCUSSION

Of the Honduran medical students in our study, 16.6% intended to work abroad. This frequency is relatively low compared with the emigration intentions reported worldwide,[9,10,14,15,20–23] which are as high as 95%.[23] It is also low when compared with similar studies in the region[18,19] and with the sample

of Latin American students evaluated in 2008 by Mayta-Tristán and colleagues.[17] This study also included a subgroup of Honduran students and found an emigration intention of 26.5%.[17] However, Honduras has not been recognized as an important source country of medical personnel,[3] which suggests there is likely no strong "emigration culture" motivating students to leave the country.

These inconsistent findings may be explained by an error produced by the small sample of Honduran students included in the study by Mayta-Tristán and colleagues.[17] Nevertheless, the proportion of medical students in our study who intend to emigrate is lower than the proportion reported in most previous studies. Consequently, it is reasonable to presume that Honduran physicians in training believe that their country can offer the academic and personal opportunities that have been identified to influence physician retention.[8–10,12,17–24]

In the current study, only 11.2% of the participants intended to work in a rural area, which is substantially less than the proportion of medical

Table 1: Characteristics of participants, *n* = 564*

Characteristic	No. (%) Total	Intention to emigrate	Intention to work in a rural setting
Sex, *n* = 561			
Female	349 (62.2)	53 (15.2)	39 (11.2)
Male	212 (37.8)	40 (18.9)	24 (11.3)
Year of medical school			
First	159 (28.2)	22 (13.8)	10 (6.3)
Second	106 (18.8)	18 (17.0)	11 (10.4)
Third	92 (16.3)	22 (23.9)	14 (15.2)
Fourth	83 (14.7)	14 (16.9)	12 (14.5)
Fifth	63 (11.2)	7 (11.1)	11 (17.5)
Sixth	61 (10.8)	10 (16.4)	5 (8.2)
Migrated for medical school, *n* = 561			
No	283 (50.4)	56 (19.8)†	33 (11.7)
Yes	278 (49.5)	37 (13.3)	29 (10.4)
English proficiency			
None	142 (25.2)	15 (10.6)†	17 (12.0)
Basic	175 (31.0)	27 (15.6)	22 (12.6)
Intermediate	149 (26.4)	26 (17.4)	16 (10.7)
Advanced	98 (17.4)	25 (25.5)	8 (8.2)
Physicians in the family			
None	265 (47.0)	33 (12.5)†	32 (12.1)
Parents, grandparents, siblings	74 (13.1)	16 (21.6)	9 (12.2)
Other relatives	225 (39.9)	44 (19.6)	22 (9.8)
Parental influence on career choice			
No	464 (82.3)	75 (16.2)	50 (10.8)
Yes	100 (17.7)	18 (18.0)	13 (13.0)
Maternal education			
≤ High school	179 (31.7)	21 (11.7)†	26 (14.6)†
Technical institute	118 (20.9)	20 (17.0)	16 (13.6)
University	200 (35.5)	34 (17.0)	19 (9.5)
Postgraduate	67 (11.9)	18 (27.7)	2 (3.0)
Paternal education			
≤ High school	141 (25.0)	9 (6.4)†	24 (17.0)†
Technical institute	106 (18.8)	20 (18.9)	14 (13.2)
University	222 (39.4)	40 (18.0)	23 (10.4)
Postgraduate	95 (16.8)	24 (25.3)	2 (2.1)

*Unless stated otherwise.
†$p < 0.05$

students who intend to work in rural settings in Ethiopia (29.5%)[15] and Ghana (57.5%).[14] However, the findings of Feldman and colleagues[13] in Canada are similar to ours. Our results are also consistent with the Hungarian situation, where the vast majority of the students are willing to work in the capital or a large city.[25] This pattern in Honduras may favour the maldistribution of physicians throughout the territory, especially considering that 51% of the population live in a rural setting.[26]

We found that the students who intend to emigrate are more likely to have more educated parents than those who want to stay in Honduras. For paternal education, the association was present in all the models tested and its magnitude increased with the level of education. However, for maternal education, the association was only present in some models for postgraduate training. These results are inconsistent with previous findings, which did not find any association between intention to emigrate and parental level of education.[14,15] However, these other studies did not categorize level of education as we did, which may contribute to the discrepancy.

Regarding the willingness to work in a rural setting, students whose parents (especially the father) underwent postgraduate studies were less likely to consider this option. Previous reports from Canada and Ghana (high- and low-income countries, respectively) also showed that students with less-educated parents tend to choose rural medicine more than urban medicine or a specialty other than family medicine.[13,14] However, to our knowledge, the current study is the first to confirm this issue in Latin America.

Our results form the impression that having educated parents make students more willing to go abroad and less willing to work in a rural area. This may be due to an expectations-fulfilling mindset related to perceptions about certain types of training and careers being more prestigious. Moreover, the father's education was more strongly associated with the outcomes. This may be partly explained by the

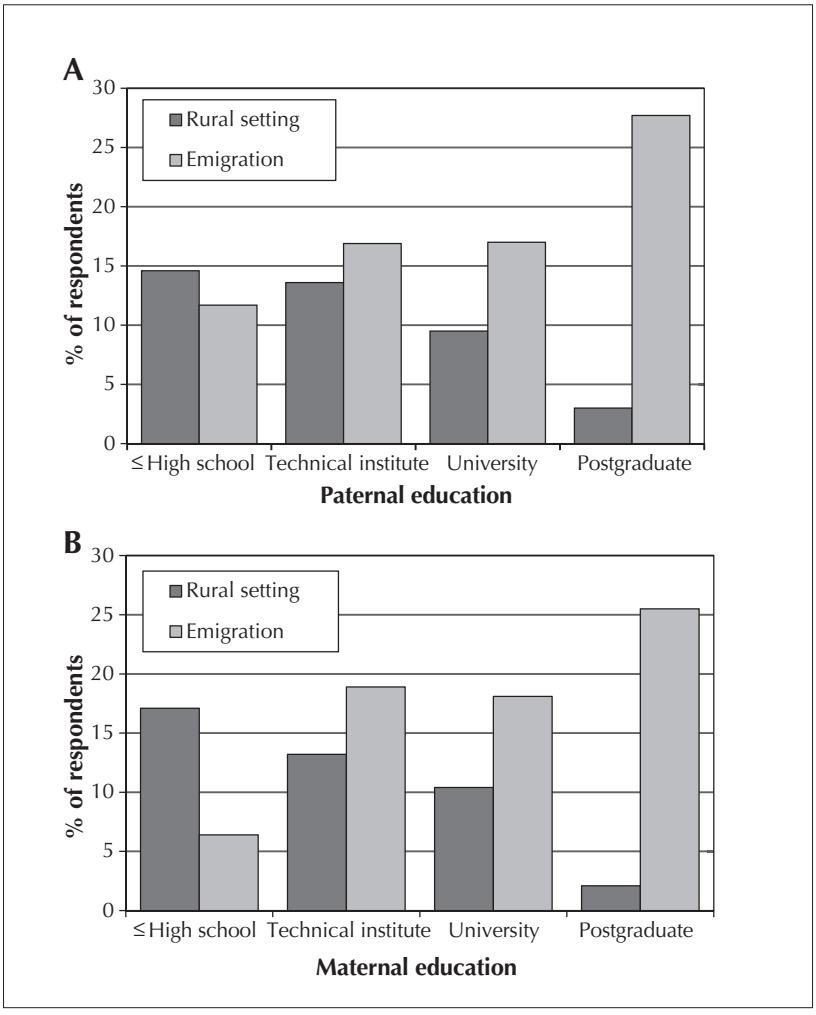


Fig. 1. Percentage of respondents (n = 564) who reported the intention to emigrate or to work in a rural setting, by paternal (A) and maternal (B) education.

Table 2: Parental education associated with intention to emigrate

	Education level; prevalence ratio (95% CI)*		
Variable	Technical institute	University	Postgraduate
Paternal			
Crude	2.96 (1.40–6.23)‡‡	2.84 (1.42–5.67)‡‡	4.00 (1.95–8.23)‡‡
Model 1†	2.94 (1.40–6.18)‡‡	2.69 (1.34–5.40)‡‡	3.82 (1.84–7.92)‡‡
Model 2‡	2.67 (1.25–5.68)‡‡	2.41 (1.16–5.00)‡‡	3.06 (1.40–6.70)‡‡
Model 3§	2.81 (1.33–5.95)‡‡	2.70 (1.34–5.42)‡‡	3.74 (1.82–7.70)‡‡
Model 4¶	2.54 (1.19–5.41)‡‡	2.20 (1.06–4.57)‡‡	2.79 (1.28–6.10)‡‡
Model 5**	2.85 (1.30–6.23)‡‡	2.65 (1.22–5.78)‡‡	3.62 (1.51–8.64)‡‡
Model 6††	2.53 (1.16–5.55)‡‡	2.39 (1.08–5.30)‡‡	2.78 (1.13–6.87)‡‡
Maternal			
Crude	1.44 (0.82–2.55)	1.45 (0.87–2.40)	2.36 (1.35–4.14)‡‡
Model 1†	1.39 (0.80–2.44)	1.36 (0.81–2.29)	2.24 (1.27–3.96)‡‡
Model 2‡	1.30 (0.73–2.32)	1.19 (0.70–2.04)	1.77 (0.97–3.23)
Model 3§	1.35 (0.76–2.42)	1.34 (0.81–2.23)	2.16 (1.22–3.80)‡‡
Model 4¶	1.20 (0.67–2.13)	1.06 (0.62–1.81)	1.57 (0.86–2.85)
Model 5**	1.19 (0.67–2.12)	1.02 (0.58–1.80)	1.35 (0.67–2.75)
Model 6††	1.08 (0.60–1.92)	0.87 (0.49–1.54)	1.14 (0.56–2.30)

CI = confidence interval.
*Comparison made using high school as the reference.
†Adjusted for sex, age and year of study.
‡Adjusted for migration to attend medical school and English-language proficiency.
§Adjusted for parental influence on the decision to study medicine and having close relatives who are physicians.
¶Adjusted for models 1, 2 and 3.
**Adjusted for maternal and paternal education, respectively.
††Adjusted for models 4 and 5.
‡‡$p < 0.05$.

Table 3: Parental education associated with intention to work in a rural setting

	Education level; prevalence ratio (95% CI)*		
Variable	Technical institute	University	Postgraduate
Paternal			
Crude	0.77 (0.41–1.42)	0.60 (0.36–1.03)	0.12 (0.03–0.51)‡‡
Model 1†	0.89 (0.48–1.63)	0.68 (0.39–1.18)	0.14 (0.03–0.60)‡‡
Model 2‡	0.73 (0.40–1.33)	0.55 (0.31–0.97)‡‡	0.10 (0.02–0.47)‡‡
Model 3§	0.79 (0.43–1.43)	0.61 (0.36–1.03)	0.12 (0.03–0.51)‡‡
Model 4¶	0.87 (0.48–1.58)	0.62 (0.35–1.10)	0.12 (0.03–0.55)‡‡
Model 5**	0.82 (0.45–1.51)	0.69 (0.39–1.21)	0.15 (0.04–0.58)‡‡
Model 6††	0.90 (0.50–1.61)	0.65 (0.39–1.19)	0.13 (0.03–0.55)‡‡
Maternal			
Crude	0.93 (0.52–1.65)	0.65 (0.37–1.13)	0.20 (0.05–0.84)‡‡
Model 1†	1.06 (0.60–1.90)	0.77 (0.44–1.37)	0.25 (0.06–1.05)
Model 2‡	0.94 (0.53–1.65)	0.65 (0.36–1.17)	0.20 (0.05–0.87)‡‡
Model 3§	0.94 (0.53–1.68)	0.65 (0.38–1.14)	0.21 (0.05–0.85)‡‡
Model 4¶	1.10 (0.61–1.97)	0.78 (0.43–1.42)	0.25 (0.06–1.09)
Model 5**	1.17 (0.65–2.12)	0.97 (0.54–1.75)	0.38 (0.94–1.55)
Model 6††	1.40 (0.76–2.57)	1.12 (0.62–2.04)	0.27 (0.11–1.88)

CI = confidence interval.
*Comparison made using high school as the reference.
†Adjusted for sex, age and year of study.
‡Adjusted for migration to attend medical school and English-language proficiency.
§Adjusted for parental influence on the decision to study medicine and having close relatives who are physicians.
¶Adjusted for models 1, 2 and 3.
**Adjusted for maternal education.
††Adjusted for models 4 and 5.
‡‡$p < 0.05$.

more significant role fathers may play in academic or professional aspects of their children's lives.[27]

Researchers have previously proposed that some factors associated with intention to work in a rural area be taken into consideration for the selection processes of medical schools.[18] Having a rural background is one of the most well-known factors, such as having rural parents and being born, raised or trained in a rural or deprived area.[5,11,12,15,28] Likewise, parental education could be considered as a factor when selecting applicants for medical school. Students who are more likely to work in a rural area and/or are less likely to emigrate could be selected to improve the retention rates of physicians and to encourage distribution of physicians that would serve rural and underserved territories.

In Honduras and other countries (both developing and developed countries), a progressively higher level of education will possibly create generations of more educated parents, potentially worsening the maldistribution of human resources. The strategies and policies that are known to be effective should be taken into account to avoid the crystallization of this trend. Better opportunities for postgraduate training and enhanced labour conditions have been proven to increase retention rates.[22] And human resources have been increased in rural settings through the creation of rural medical schools and through efforts to enhance the importance of rural background in future physicians.[11,13,14,29] It is crucial that action be taken in this respect, given that countries in which these strategies have not been strongly and effectively developed may experience a deeper human resources shortage and resulting health crisis.[30]

Limitations

The present study has some limitations. We measured only the intentions and perspectives of medical students, and did not assess whether students actually went abroad or to a rural area. The cross-sectional design of the study does not permit finding causal relations, but only associated factors. Finally, a convenience sample could lead to skewed results because it does not fully represent the population of Honduran medical students. However, the study sample is a close approximation given that, for 2008, UNAH students comprised more than 80% of the country's medical students from all years of training.

CONCLUSION

Of the Honduran medical students in our study, one out of 6 intended to emigrate to work after finishing medical school. Only one out of 9 were willing to work in a rural setting inside the country. Students whose parents had a higher level of education were more likely to intend to emigrate or work in a nonrural setting in Honduras. Parental education should be considered in medical schools' selection processes to improve physician retention and ensure adequate distribution of physicians in rural and underserved areas.

Competing interests: None declared.

REFERENCES

1. *World health report 2006: working together for health*. Geneva: World Health Organization; 2006.
2. *World health statistics 2012*. Geneva: World Health Organization; 2012.
3. Mullan F. The metrics of the physician brain drain. *N Engl J Med* 2005;353:1810-8.
4. Forstenlechner I. Brain drain in developed countries: Can governments do anything to bring expatriates back? *Public Policy and Administration* 2010;25:156-74.
5. Serneels P, Montalvo JG, Pettersson G, et al. Who wants to work in a rural health post? The role of intrinsic motivation, rural background and faith-based institutions in Ethiopia and Rwanda. *Bull World Health Organ* 2010;88:342-9.
6. Henry JA, Edwards BJ, Crotty B. Why do medical graduates choose rural careers? *Rural Remote Health* 2009;9:1083.
7. Nullis-Kapp C. Health worker shortage could derail development goals. *Bull World Health Organ* 2005;83:5-6.
8. Aly Z, Taj F. Why Pakistani medical graduates must remain free to emigrate. *PLoS Med* 2008;5:e2.
9. Syed NA, Khimani F, Andrades M, et al. Reason for migration among medical students from Karachi. *Med Educ* 2008;42:61-8.
10. Bernardini-Zambrini D, Barengo N, Bardach A, et al. [Emigrate or not? How would the next Spanish generation of physicians decide? A study on emigration-related reasons and motivations of advanced medical students in 11 Universities in Spain]. [Article in Spanish]. *Aten Primaria* 2011;43:222-6.
11. de Vries E, Reid S. Do South African medical students of rural origin return to rural practice? *S Afr Med J* 2003;93:789-93.
12. Daniels ZM, Vanleit BJ, Skipper BJ, et al. Factors in recruiting and retaining health professionals for rural practice. *J Rural Health* 2007;23:62-71.
13. Feldman K, Woloschuk W, Gowans M, et al. The difference between medical students interested in rural family medicine versus urban family or specialty medicine. *Can J Rural Med* 2008; 13:73-9.
14. Kotha SR, Johnson JC, Galea S, et al. Lifecourse factors and likelihood of rural practice and emigration: a survey of Ghanaian medical students. *Rural Remote Health* 2012;12:1898.
15. Deressa W, Azazh A. Attitudes of undergraduate medical students of Addis Ababa University towards medical practice and migration, Ethiopia. *BMC Med Educ* 2012;12:68.
16. Fraser B. Human resources for health in the Americas. *Lancet* 2007;369:179-80.
17. Mayta-Tristán P, Carbajal-Gonzalez D, Mezones-Holguín E, et al. Perspectivas profesionales e intención de emigración de los estudiantes de Medicina de nueve países de Latinoamérica, 2008: Estudio preliminar. *CIMEL* 2010;15:3-8.
18. Hernández T, Ortiz Gómez Y. La migración de médicos en Venezuela. *Rev Panam Salud Publica* 2011;30:177-81.

19. Pereyra-Elías R, Cassana A, Mezones-Holguín E, et al. Diferencias según género en la intención de emigración de médicos recién egresados. *An Fac Med (Lima)* 2013;74:211-6.
20. Krajewski-Siuda K, Szromek A, Romaniuk P, et al. Emigration preferences and plans among medical students in Poland. *Hum Resour Health* 2012;10:8.
21. Imran N, Azeem Z, Haider II, et al. Brain drain: post graduation migration intentions and the influencing factors among medical graduates from Lahore, Pakistan. *BMC Res Notes* 2011;4:417.
22. Lassey AT, Lassey PD, Boamah M. Career destinations of University of Ghana medical school graduates of various year groups. *Ghana Med J* 2013;47:87-91.
23. Akl EA, Maroun N, Major S, et al. Post-graduation migration intentions of students of Lebanese medical schools: a survey study. *BMC Public Health* 2008;8:191.
24. Bailey N, Mandeville KL, Rhodes T, et al. Postgraduate career intentions of medical students and recent graduates in Malawi: a qualitative interview study. *BMC Med Educ* 2012;12:87.
25. Girasek E, Eke E, Szócska M. Analysis of a survey on young doctors' willingness to work in rural Hungary. *Hum Resour Health* 2010;8:13.
26. *Encuesta Nacional de Demografía y Salud.* Tegucigalpa: Instituto Nacional de Estadística; 2012.
27. Sonnert G. Parents who influence their children to become scientists: effects of gender and parental education. *Soc Stud Sci* 2009; 39:927-41.
28. Zimmerman M, Shakya R, Pokhrel BM, et al. Medical students' characteristics as predictors of career practice location: retrospective cohort study tracking graduates of Nepal's first medical college. *BMJ* 2012;345:e4826.
29. Igumbor EU, Kwizera EN. The positive impact of rural medical schools on rural intern choices. *Rural Remote Health* 2005;5: 417.
30. Tankwanchi AB, Ozden C, Vermund SH. Physician emigration from sub-Saharan Africa to the United States: analysis of the 2011 AMA physician masterfile. *PLoS Med* 2013;10:e1001513.

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**.

Joint position paper on rural surgery and operative delivery

This joint position paper has been endorsed by The College of Family Physicians of Canada, The Society of Obstetricians and Gynaecologists of Canada, the Canadian Association of General Surgeons and the Society of Rural Physicians of Canada

Stuart Iglesias, MD
Bella Bella, BC

Jude Kornelsen, PhD
Salt Spring Island, BC

Robert Woollard, MD
Vancouver, BC

Nadine Caron, MD
Prince George, BC

Garth Warnock, MD
Vancouver, BC

Randall Friesen, MD
Prince Albert, Sask.

Peter Miles, MD
Grande Prairie, Alta.

Victoria Vogt Haines, MD
Revelstoke, BC

Bret Batchelor, MD
Vanderhoof, BC

Jenny Blake, MD
Ottawa, Ont.

Garey Mazowita, MD
Vancouver, BC

Roy Wyman, MD
Toronto, Ont.

Brian Geller, MD
Meadow Lake, Sask.

Braam de Klerk, MD
Inuvik, NWT

Correspondence to:
Stuart Iglesias;
siglesias64@gmail.com

Our professional organizations have prepared this paper as part of an integrated, multidisciplinary plan to ensure the availability of well-trained practitioner teams to sustain safe, effective and high-quality rural surgical and operative delivery services. Without these robust local (or nearby) surgical services, sustaining rural maternity care is much more difficult. This paper describes the "network model" as a health human resources solution to meet the surgical needs, including operative delivery, of rural residents; outlines necessary policy directions for achieving this solution; and poses a series of enabling recommendations.

Nos organisations professionnelles ont préparé cet article dans le cadre d'un plan multidisciplinaire intégré visant à assurer la disponibilité d'équipes soignantes bien formées pour offrir des services obstétricaux interventionnels et chirurgicaux sécuritaires, efficaces et de grande qualité en milieu rural. Sans de tels solides services chirurgicaux locaux (ou de proximité), il est beaucoup plus difficile d'assurer les soins obstétricaux en milieu rural. Cet article décrit le « modèle en réseau » comme une solution au chapitre des ressources humaines en santé pour répondre aux besoins chirurgicaux des populations rurales, y compris pour les services obstétricaux interventionnels. On y décrit aussi les orientations politiques nécessaires à l'application de cette solution et on formule une série de recommandations préparatoires.

OVERVIEW

The precipitous attrition of small-volume surgical programs in rural Canada over the past 2 decades has led to the need for rural residents to travel for even the most basic procedural care.[1–3] Simultaneously with local program loss, the increasing subspecialization of general surgery and the narrowing of the generalist platform of rural general surgery have further diminished surgical services to rural Canadians.[4] Although poorer health outcomes have been shown to be proportionate to distance to services in maternity care,[5–7] the effects of distance on the health outcomes of other procedural care is largely unknown.

There is an urgent need for a solution to the downgrading and loss of surgical services in rural Canada: these service populations, including the large majority of Canada's First Nations population, represent some of Canada's poorest, sickest and most vulnerable people.[8,9] Beyond equity in access, the intrinsic local benefits to local surgical programs include increasing community capacity to recruit and retain family physicians and other health care providers in rural settings; maintaining a high level of medical competence in the community, particularly in regard to serious illness and emergency services; and providing the context for rural education and research.

At a community level, this translates into ensuring the availability of a surgical first responder, trained to handle a variety of scenarios that require immediate intervention, such as trauma. The professional team of anesthetic and operating room personnel supports both

provider confidence and the inclination to offer high-quality care locally to acutely ill patients in a low-resource setting. The presence of generalist physicians trained in surgical and anesthetic care supports the recruitment and retention of generalist colleagues in sufficient numbers to maintain full-service local health care, including emergency services.

The College of Family Physicians of Canada (CFPC), The Society of Obstetricians and Gynaecologists of Canada (SOGC), the Canadian Association of General Surgeons (CAGS) and the Society of Rural Physicians of Canada (SRPC) have prepared this paper as part of an integrated, multidisciplinary plan to ensure the availability of well-trained practitioner teams to sustain safe, effective and high-quality rural surgical and obstetric services. Evidence on best practices suggests this care should be provided as close to home as reasonably possible.[5–7,10] This collaborative process was initiated by the executive leadership of the 4 organizations by teleconference in December 2013. This was followed by one face-to-face meeting in Banff, Alta., in March 2014. A writing group worked electronically, culminating in a face-to-face meeting in December 2014. A draft was submitted to the same executive leadership in January 2015 to be considered by the governance of these organizations. It has subsequently been endorsed by the executive leadership and is in the process of dissemination through their professional journals and websites. This position paper builds on the previous work done through joint position papers on rural maternity care and anesthesia.[10–13]

Based on a review of international literature and outcomes[14] and personal observations from services in Canada, we believe the most effective way to provide a robust rural surgical infrastructure is through a networked system of specialist–generalist surgical care. This model has been well-documented in other jurisdictions, including Australia, as a "hub and spoke" model.[15,16] Within Canada, networks of care that include community specialists and family physicians with enhanced training and bridge the urban–rural divide have demonstrated success in cancer care,[17,18] palliative care,[19] HIV care and psychiatric care,[20] among others. Some perinatal programs in Canada are examples of well-documented network models with positive outcomes.[21,22]

This paper describes the "network model" as a health human resources solution to meet the surgical needs, including operative delivery, of rural residents; outlines necessary policy directions for achieving this solution; and poses a series of enabling recommendations.

PART I: BACKGROUND AND CONTEXT

Generalism in rural surgical care

Currently in Canada and internationally, there is interest in, and receptivity to, the role of generalists in the delivery of health care.[23] The return to generalism (see Glossary, no. 1) has been precipitated by rigorous evidence pointing to its effectiveness[24–27] and the attendant cost savings it suggests.[28,29] This trend has influenced current thought in surgical care and given renewed energy to the roles of generalist general surgeons[4] and rural family physicians with enhanced surgical skills (FPESS)[30] (see Glossary, no. 2). In part, this solution is a response to the significant attrition of Canada's small-volume rural surgical programs and the attendant closure of rural maternity services.[5,31] But it is also a response to the recognition of the serious challenges the loss of rural surgical care has to rural health care more broadly, including its capacity to sustain trauma, critical and emergency care; to recruit and retain a critical mass of care providers; and to deliver equitable access to health care.

Generalists, whether in surgery or family medicine, are characterized by their broad skill set and the additional acquisition of competencies across a range of functions or specialties.[32] For specialist surgeons, this may include the acquisition of competencies across a range of distinct specialty services, including obstetrics and gynecology (OB–GYN), orthopedics, ears, nose and throat (ENT), urology, plastic surgery and others.[33,34] Family physicians who are trained in procedural medicine and are able to perform an appendectomy and/or cesarean delivery have been described as having enhanced surgical skills in family practice,[35] which is now recognized as a program area with the Section of Communities of Practice in Family Medicine (CPFM) within the CFPC (see Glossary, no. 3). Similar CPFM programs exist in family practice anesthesia, emergency medicine, palliative care, and health care of the elderly.

Demographic scan

Historically in Canada, general surgeons have played a significant role in meeting the surgical needs of rural residents, if not locally, then in close proximity to their home communities.[36] Their generalist nature was well-suited to the low-volume environments, which could not support multiple specialist practitioners.

The practice of general surgery differs in urban and rural settings.[4] The scope of practice of rural practitioners tends to be wider than that of their

urban counterparts, with rural general surgeons performing a range of procedures that would ordinarily be taken on by other surgical specialties in urban settings.[32,37] Additionally, community and regional general surgeons provide both primary and back-up services outside the general surgical domain, whereas tertiary surgeons do not.[38] In 2014, the Task Force on the Future of General Surgery recommended that formalized training in areas of added competencies be available to ensure that the graduates of training programs were well prepared to deliver surgical care in all parts of Canada.[4]

In Ontario and eastern Canada, rural surgical services, including cesarean delivery, are provided almost exclusively by generalist general surgeons.[39,40] In western Canada, general surgeons are supported by about 150 FPESS providers, working either collaboratively with specialists, or, in the smaller programs, by themselves.[22,30,41,42] Currently, less than 4% of OB–GYNs practise in communities of less than 25 000.[1] The presence of outreach surgical services plays a large role in the sustainability of the rural programs by contributing to the threshold of procedure volume for the surgical teams at these centres. Their strategic role reaches beyond their procedural competence into their role in fostering communities of practice and networks of care.[2]

Historically, rural Canada has recruited international medical graduates, supplemented by a small population of Canadian-trained physicians, for its FPESS workforce. The Canadian-based training was largely through ad hoc mentorship by preceptors. Currently, one curriculum-based accredited training program for full-service FPESS is offered in Canada through the University of Saskatchewan at its Prince Albert site (graduating 2 FPESSs per year).[30] For those FPESSs whose surgical skill set consists exclusively of operative delivery, 3–6 month postgraduate training blocks are available through most medical schools. The training curriculum, evaluation and credentialling for this focused skill set are neither formalized nor always nested within mainstream medical education.

Sustainability of rural maternity care

It is public policy, supported by strong evidence and consensus recommendations, that women should be able to deliver as close to home as possible.[10–12,14,43] There is good evidence that women residing in communities with no local intrapartum obstetric services, and who are obliged to travel for care, have worse outcomes than those of the same clinical cohort who have access to at least some local services.[5–7,44,45] The evidence does show that limited local maternity care programs, offering intrapartum services to a select screened population, achieve safe outcomes.[46–48] However, the reality has been that, faced with very large maternity outflows (> 70%) and significant provider stresses, these programs are largely unsustainable.[14] We acknowledge that these observed closures are not a necessary phenomenon. There are a few examples of rural maternity care programs, without local or nearby operative delivery services, that have thrived while providing safe outcomes.[10,11] However, in the face of the significant attrition of programs in similar circumstances, these success stories are the exception, rather than the rule.

The link between sustainable rural maternity care and local operative delivery services has been appreciated at a systems level (i.e., through training programs). Without robust local (or nearby) surgical services, sustaining local operative delivery, and, with it, rural maternity care, is much more difficult.[2] The decline of rural surgical services and concomitant loss of maternity services in all jurisdictions across rural Canada have emphasized this relation.[2] Due to the low volume of procedures, with the attendant issues for staffing and continuous coverage, as well as recruitment of a stable supply of professional staff, efforts to sustain stand-alone local operative delivery programs have been largely unsuccessful.[2,3] Although emerging evidence points to the safety of maternity services without local capacity for cesarean delivery,[10,11,46,47,49–51] the human resources infrastructure is fragile.[14,21,26,31,49,52]

Maternity care programs occupy a strategic position in rural communities. Research into community health suggests that these programs are vital not only for health services, but also for the economic and social fabric of the community.[53]

Safety of rural surgical programs

Small- versus large-volume surgical programs

There is a large body of literature on the volume–outcome relation for complex surgical procedures. Generally, the more complex the procedure, the stronger the relation between improved outcomes for higher volume.[54] None of these very complex procedures are performed in rural Canada. Of the less complex procedures, for which there is a weaker volume–outcome relation, only breast surgery and colectomy are usually performed, and then only in some of the larger-volume rural programs.

In an exhaustive review of the international literature, the authors found no studies that document improved outcomes with larger volumes for the surgical procedures usually performed in the small-volume programs in rural Canada.[14,54]

Procedural safety, however, is only one dimension of patient safety that network models address. Although procedural safety is the starting point for decisions on the location of a procedure, a holistic approach to risk must be applied to the context of such decisions. This includes the risk of patient travel; the social costs of separation from family and community, including but not limited to the health and well-being of family members left behind and consequences of weakened ties to the community; and immediate and long-term financial implications for the family.[55]

Generalist versus specialist providers

In a comprehensive review of the international literature on operative obstetrics, Kornelsen and colleagues[14] found that "[t]here is no existing clinical, case study, or qualitative evidence that basic maternal surgical care, including caesarean section, is less safe when provided by GP proceduralists with enhanced surgical skills than when provided by specialist obstetricians." The report details further the current literature on safety and sustainability of small-volume surgical programs and, along with the earlier Australian report by Pashen and colleagues,[29] provides a comprehensive endorsement of the safety of broad-scope FPESS care. This safety and outcome history has been built on a practice profile of careful triage, risk identification and patient selection by FPESS providers, with referral of patients to the providers and centres most suited to their anticipated needs.[16]

We found no studies that compare outcomes for generalist specialist surgeons performing procedures in areas of added competence, such as cesarean delivery.

PART II: A NETWORK MODEL OF RURAL SURGICAL SERVICES

A robust model of rural surgical care is contingent on genuine and productive interprofessional relationships among care providers throughout all levels of the health care system. Each rural surgeon, whether specialist or generalist, should be nested within a supportive community of practice that includes his or her own colleagues (both generalist and specialist), his or her mentors, teachers, and those who accept referrals and patient transfers[56–60] (see Glossary, no. 4). These networks of care should also include the other professions on which surgical and obstetric care rely (e.g., anesthesia, pediatrics, nursing, midwifery, laboratory medicine, diagnostic imaging and transportation).[34,61,62] The networks should be highly integrated across geography where referral centres function collaboratively with the local rural surgical program and should be formal, with a defined structure, and form the platform for both continuing professional development and continuous quality-improvement activities.[2,63]

Specifically, a network model is the formalization of interprofessional service networks between small surgical services and regional referral and tertiary services. Although there may be substantial variability in the structure of such models due to population size, distance from referral site, and transfer options, based on transportation and weather variables, the principles underlying the network model include the following:

- support of rural services by referral or regional centres in building professional capacity and confidence, competence and currency in practice;[57,59,64]
- functional and formal referral patterns from smaller rural services ("spokes") to larger rural services ("hubs") and finally to the highest-level regional metropolitan specialist and subspecialist services, according to risk or need;[46,47,60,65,66]
- effective and efficient mechanisms of patient transport for acute and subacute cases;[67]
- integrated referral, which includes documented discharge, with awareness of rural site capacity, improved through both relationship-building and formal asset mapping;[68]
- educational programs undertaken with referral hospitals at both a site- and system-level, linked to monitoring and quality improvement.[61,69]

A network model, properly conceived, increases the capacity for surgical care, simultaneously and significantly, in both the centre and the periphery. Improved access and utilization across the network by marginalized rural populations means the distribution of the clinical activity within the network is optimized.

Approaching the surgical needs of rural residents from a network model perspective invests in preventive, upstream and recovery services as close to home as possible, in order to provide appropriate and efficient care, by avoiding unnecessary involvement of higher levels of care. Further, the formal integration of surgical care providers between levels of care lessens the opportunity for gaps in continuity often associated with health care transitions.

The benefits of taking a comprehensive view of a patient's journey through the surgical process and

acknowledging health care transitions have been examined in the enhanced recovery after surgery (ERAS) model. The ERAS Society states that "ERAS is a multimodal perioperative care pathway designed to achieve early recovery for patients undergoing major surgery."[70] We believe that a network model of surgery, integrating and using local surgical resources, either by local provision of the procedure itself, or by skilled pre- and postoperative care closer to home, can contribute to the ERAS successes.

Fearon and colleagues[71] examine the often intersecting factors that prolong a patient's stay in care facilities, including the need for parenteral analgesia, intravenous fluids as a result of gut dysfunction and a lack of mobility requiring bed rest. The fundamental purpose of the ERAS pathway serves to address these factors by reducing physiologic stress caused by surgical procedures and promote rapid recovery.[72] According to the ERAS Society. "[t]he central elements of the ERAS pathway address these key factors, helping to clarify how they interact to affect patient recovery. In addition, the ERAS pathway provides guidance to all involved in perioperative care, helping them to work as a well-coordinated team to provide the best care."[70] A meta-analysis of 6 randomized controlled trials involving more than 400 patients undergoing colonic or colorectal surgery found that patients receiving ERAS protocols had a shorter stay by 2 days and an almost 50% reduction in postoperative complications.[72] In addition to improving patient outcome and recovery time by altering traditionally perioperative care, the ERAS protocol emphasizes the importance of patient-centred care and continuity of care through interprofessional collaboration.[71] Use of the ERAS pathway has been shown to reduce care time by more than 30% and reduce postoperative complications by up to 50%.[71]

This approach would complement the structure and intent of a network model of rural surgical care. To optimize this approach, focus and attention must be paid to 4 key priority areas: practice environments; education and training; continuous quality assurance and improvement; and credentialling and privileging. These priority areas must be framed within a culture of patient safety.

RECOMMENDATIONS: NETWORK MODEL

1) Whereas the formalization of interprofessional service networks between small surgical programs and those in regional and tertiary settings through network models of rural surgical care is the optimal health human resources solution to meet the surgical needs of rural residents, we recommend that network models of integrated rural surgical services be established and maintained by all key professions in rural Canada.
2) Referral specialists and rural FPESS providers should work together across the local region within inclusive departments of rural surgery and maternity care and within programs of measured outcomes and continuous quality improvement.
3) With deference to local geography, weather and transport, each patient should receive surgical care as close to home as possible by a provider and in a setting best suited to their anticipated needs. A model for this is the present regionalization of care models of the provincial perinatal programs.
4) Decisions on procedural care in rural communities should reflect the patient diagnosis, the complexity of the procedure, the patient comorbidities, the skill sets of the local and itinerant providers, and the resources of the local environment, including, but not limited to, nursing, anesthesia, laboratory (including blood banking), imaging, geography and transport.
5) Network models should be built on platforms of efficient, effective and safe transport.
6) When it is appropriate for a patient to travel for surgery, including operative delivery, to a higher level of care that is best suited to their anticipated needs, every effort should be made to integrate their local program into the preparation for, and the recovery from, their surgery.

PRACTICE ENVIRONMENTS

For maximally effective processes and outcomes, networks of rural surgical and obstetric care should be made up of a nexus of colleagues and organizations that are linked and interreliant through professional and personal relationships, training pathways, referral pathways, and distant and local collaboration. Network members should be within easy and immediate communication. They should engage together in continuing professional development, quality enhancement and advocacy for and with communities for improved health outcomes.[63] The culture should be patient-centred and considerate of the community. It then follows that rural surgical programs should be nested within a regional program. Local providers should deliver surgical care within an integrated network where they are supported by regional staff who are available for consultation. Learning occurs in a continuous, seamless model.

Within this model, the intrinsic health and social risk of isolation needs to be recognized. A complete assessment of a program should consider not only quality and safety, but also the risk of not providing a service. This complete assessment should be done preceding any decision to restrict a rural surgical service or program.

RECOMMENDATIONS: PRACTICE ENVIRONMENTS

1) Integrate rural and regional surgical and operative delivery programs within a defined catchment area, across regional geography into the same departments that are inclusive of the rural specialists and the FPESS surgeons together with their regional colleagues. This provides a common platform for continuing medical education and continuous quality improvement activities and anticipates some mobility by some physicians across urban and rural locations for purposes of service delivery, training and mentoring.
2) Structure rural surgical programs around a range of procedure options, based on provider and institutional capacity, as well as population needs.
3) Plan decisions regarding local surgical services to include the financial and social costs, and health care outcomes, as well as the risks of not providing the service.
4) Consider all decisions on surgical, maternity and endoscopic care within the framework of safety and holistic risk. This includes the risks and costs of patient travel, timeliness, operative safety, family separation, nondelivery of service and avoidance of presentation.
5) All of our recommendations in this joint position paper are intended to apply equally to the provision of endoscopic services for rural Canadians.

EDUCATION AND TRAINING PROGRAMS

To support a robust network model of rural surgical care, educational programs reflecting the realities of rural practice and the needs of rural communities need to be built with the participation of the generalist specialist surgeons and FPESS providers. These educational programs, both entry-level and continuing professional development, should reflect the importance of a generalist workforce to rural health care. Doctors who are trained and have credentials to provide rural surgical services are an essential requirement for health service delivery in rural communities.

RECOMMENDATIONS: TRAINING PROGRAMS

1) Deliver a core, competency-based curriculum, reflective of the required skill set of FPESS providers, in recognized programs for training, evaluation and certification.
2) Develop a distinct core competency-based curriculum, reflective of the required skill set of operative delivery, in recognized programs for training, evaluation and certification.
3) Develop pathways for the training, evaluation and certification of added competencies across disciplines for rural general surgeons, with particular attention to the strategic role they play in rural maternity care.
4) Develop pathways for the training, evaluation, and certification of added competencies across disciplines, for rural OB–GYNs, with particular attention to the strategic role they play in rural surgical care.

CONTINUOUS QUALITY IMPROVEMENT PROGRAMS

The network model of rural surgical care rests on documenting, reporting and examining risk-adjusted surgical outcomes, through an iterative process, to ensure safe and effective care. Because of the practical difficulties of measuring quality and competence, using risk-adjusted outcomes, there has been an attraction to using numbers of procedures performed, either by programs or by health professionals, as a surrogate for competence. This approach to competency is derived from the volume–outcome literature. Methodologically, it has some attraction in an urban context, where care is delivered within a model of high-volume specialization and subspecialization, and for those procedures where volume has been shown to be linked to outcome (e.g., pancreaticoduodenectomy or esophagectomy).[73,74] However, when extrapolated to rural health care, in which care is delivered within a low-volume generalist model, and which offers few procedures where volume has been linked to outcome, it is lacking.[14,41]

If low volumes are used as a convenient, but inappropriate, alternative to outcome measures, then many rural surgical services and programs will be forced to close, not because they do not provide quality care, but because they do not perform as many procedures as their urban counterparts.

Continuous quality improvement, however, is built on protocols for risk identification and risk management, measured outcomes, systems support for individ-

uals in the context of a health care team, and the recognition that quality measurements should be applied to teams and to the systems in which they work. The concept of continuous quality improvement recognizes that most quality "failures" are due to the context or setting in which individuals are, or are not, supported to do their best work. Continuous quality improvement moves an entire staff and program toward targeted and measured results. The MORE^{OB} (Managing Obstetrical Risk Efficiently) program is an example of well-developed and well-assessed continuous quality improvement built on a platform of team competence and a culture of patient safety[75,76] (see Glossary, no. 5).

In a rural context, continuous quality improvement can be done through tracking and examining the outcomes of population catchment areas surrounding a facility: that is, the outcomes of the population within a reasonable (1 h) travel time, regardless of where they receive care. Outcomes data become the organizing principle rather than the by-product at both an individual practitioner and health system level. In the former, audit reports can be directly provided to practitioners for continuous monitoring. System-level reporting would involve building a quality-of-care framework for providers and hospitals to provide feedback on performance for the catchment area and benchmarked against other communities with similar service levels.[75]

RECOMMENDATIONS: CONTINUOUS QUALITY IMPROVEMENT

1) Make the principles of team competency and patient safety foundational to continuous quality improvement programs.
2) Create population catchment areas around each individual facility and each network of facilities such that outcomes of both can be tracked. This recognizes the interprofessional and interjurisdictional ownership of discrete health outcomes.
3) Embed a formal quality improvement process in the network (e.g., the National Surgery Quality Improvement Program of the American College of Surgeons [ACS NSQIP] and MORE^{OB}; see Glossary no. 5 and 6).
4) Provide timely feedback on risk-adjusted outcomes for purposes of continuous quality improvement.

APPROPRIATE CREDENTIALLING AND PRIVILEGING

Many rural surgical procedures are shared among several generalist disciplines. General surgeons perform cesarean deliveries. Some OB–GYNs perform appendectomies. Family physicians with enhanced surgical skills remove tonsils. Credentials for these procedures will take many forms, such as a Fellowship of the Royal College of Physicians and Surgeons (plus, possibly, a subspecialization), a potential Certificate of Added Competence (for either general surgeons or FPESS providers), individualized training for specific procedures or recognized training from other jurisdictions. In all of these, the underlying expectation is that there exists some verifiable evidence that the professional has received training to perform the procedure. Included in an applicant's credentials for privileges are the documentation of training, relevant evaluation where it exists, reference letters attesting to training and skills, and, where appropriate, reports from either mentors or practice assessments.

There are procedures that may be performed by more than one specialty. It is the responsibility of the medical staff to ensure that a single level of care is provided, regardless of which specialist is performing the procedure. This is important, as many areas of care fall within the scope of more than one discipline, and thus physicians representing several disciplines can and should be privileged to perform the same procedure, if they meet the criteria of a single standard of care.

A major vulnerability in the provision of surgical services to people in remote communities results when seasoned FPESS and specialist doctors transition out of practice and replacement doctors transition into practice. A network approach can reduce the risk of lack of coverage by providing mentorship to the newly recruited surgeons and facilitating privileges to promote seamless, sustainable care.

RECOMMENDATIONS: PRIVILEGING

Privileging should reflect the following:

1) all of the applicants' education and training, accumulated practice experience, measurement and examination of risk-adjusted outcomes and participation in both professional development and continuous quality improvement;
2) appropriateness of the procedure within the local human resources environment;
3) access to high-quality procedural care as close to home as possible, across the regional network;
4) linkages to the sustainability of other services, including local maternity care programs;
5) the regional planning infrastructure for the individual procedure, the associated clinical services and the linkages to other clinical services.

SUMMARY

The network model positions surgical care, including operative delivery, as a regional rather than institutional phenomenon, where small operating rooms are recognized as extensions of core referral hospital programs and therefore care programs can be provided through a well-integrated and balanced surgical team, including outreach surgeons and local surgical providers. It recognizes the desire for surgical procedures to be provided in the closest operative facility to the patients' residence, respecting the complexity of the procedure, the risk status of the patient, and the availability of surgical providers with procedural competency. Further, it allows surgical providers to be used to the extent of their competencies where possible and practise within supportive interdisciplinary teams. These core principles underscore an effective, efficient and sustainable network model of collaborative rural surgical care.

GLOSSARY

1. Generalism: The Cairns Consensus Statement on Rural Generalist Medicine defines rural generalist medicine "as the provision of a broad scope of medical care by a doctor in the rural context."[22] For family physicians, this has meant integrating comprehensive primary care with a range of focused secondary care in maternity care, anesthesia and surgery.[22] For specialist surgeons, this can include the acquisition of added competencies across a range of distinct specialty services, including general surgery, obstetrics–gynecology, orthopedics, ENT, urology and others.[35]

2. Enhanced surgical skills: Family physicians with significant training and appropriate skill sets in operative delivery and/or surgery have been described as family physicians with enhanced surgical skills (FPESS).[35] In operational terms, an FPESS provider is a family physician trained and able to perform an appendectomy and/or a cesarean delivery, often from within a broader skill set. Enhanced skills surgery has been recognized as a program within the Section of CPFM within the CFPC.[77]

3. Section of Communities of Practice in Family Medicine (CPFM) within the CFPC: This section, previously termed the Section of Special Interest of Focused Practice (SIFP), was introduced to give an opportunity for members to become linked to colleagues with similar practice interests. The Section of CPFM comprises 19 programs, "each of which addresses a particular area of special interest [to] members. These programs cover a range of areas [that may be part of] comprehensive care practices or in some cases major or full-time commitments. The CFPC remains committed to comprehensive continuing care."[77] Enhanced Surgical Skills (ESS) is a newly recognized program area within this section. The CFPC Board of Directors has approved in principle the awarding of Certificates of Added Competence (CACs) with special designations to recognize family physicians who have achieved a recognized level of skill and experience in a specific program area of the Section of CPFM. Five areas are currently being considered for the awarding of CACs: emergency medicine, palliative medicine, care of the elderly, GP anesthesia, and sports and exercise medicine. Work is underway to better define the enhanced skills competencies in these areas, and to confirm when and how CACs and special designations will be implemented.[77]

4. Community of practice: According to cognitive anthropologists Lave and Wenger,[78] a community of practice is a group of people who share a craft and/or a profession. The group can evolve naturally because of the members' common interest in a particular domain or area, or it can be created specifically with the goal of gaining knowledge related to their field. It is through the process of sharing information and experiences with the group that the members learn from each other and have an opportunity to develop themselves personally and professionally.[78,79]

5. MORE^{OB}: "Salus Global's Managing Obstetrical Risk Efficiently (MORE^{OB}) Program is a comprehensive performance improvement program that creates a culture of patient safety in obstetrical units. Founded on High Reliability Organization principles, the MORE^{OB} Program integrates professional practice standards and guidelines with current and evolving safety concepts, principles and tools."[80] "A professional development and performance improvement program that unfolds over three modules, it puts safety in the DNA of the birthing unit — including physicians, midwives, nurses and all other stakeholders in the unit. The MORE^{OB} Program focuses on the review of No Harm Events to find the root causes. It does not assign blame. The emphasis of the review is on understanding why certain decisions were made and how organizational systems affected the event."[81]

6. National Surgical Quality Improvement Program (American College of Surgeons) (ACS NSQIP): Each hospital assigns a trained surgical clinical

reviewer to collect preoperative through 30-day postoperative data on randomly assigned patients. The number and types of variables collected will differ from hospital to hospital, depending on the hospital's size, patient population and focus of quality improvement. The ACS provides training for surgical clinical reviewers, ongoing education opportunities and auditing to ensure data reliability. Data are entered online in a secure, Web-based platform that is compliant with the Health Insurance Portability and Accountability Act, and can be accessed 24 hours a day. A surgeon champion assigned by each hospital leads and oversees program implementation and quality initiatives. Blinded, risk-adjusted information is shared with all hospitals, allowing them to nationally benchmark their complication rates and surgical outcomes. The ACS also provides monthly conference calls, best-practice guidelines and many other resources to help hospitals target problem areas and improve surgical outcomes. Currently, most of British Columbia's large hospitals are participants. There is a project under development to pilot NSQIP in one or more of the smaller rural hospitals.[82]

Acknowledgement: The committee that prepared this paper, and the organizations they represent, wish to acknowledge the extraordinary skills, commitment and leadership brought to the table by Dr. Robert Woollard.

Competing interests: None declared.

REFERENCES

1. Pong RW, Pitblado JR. *Geographic distribution of physicians in Canada: beyond how many and where*. Ottawa (ON): Canadian Institutes of Health Research; 2005.
2. Grzybowski S, Kornelsen J. *The sustaining of small surgical services in British Columbia. A report commissioned by the Joint Standing Committee on Rural Issues*. Vancouver (BC): Centre for Rural Health Research; 2013.
3. Iglesias S, Caron N, co-chairs. *Proceedings from the Invitational Meeting on Rural Surgical Services*; 2007 June 22–23; Vancouver, BC. Available: http://ess.rccbc.ca/wp-content/uploads/sites/5/2014/12/GPSSymposiumProceedings.pdf (accessed 2015 Sept. 6).
4. *The future of general surgery: evolving to meet a changing practice*. Ottawa (ON): Royal College of Physicians and Surgeons of Canada; 2014.
5. 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.
6. Nesbitt TS, Larson EH, Rosenblatt RA, et al. Access to maternity care in rural Washington: its effect on neonatal outcomes and resource use. *Am J Public Health* 1997;87:85-90.
7. Ravelli A, Jager K, de Groot M, et al. Travel time from home to hospital and adverse perinatal outcomes in women at term in the Netherlands. *BJOG* 2011;118:457–65.
8. Society of Rural Physicians of Canada. National rural health strategy. 2008. Available: www.srpc.ca/resources_library_enter.html (accessed 2014 Dec. 1).
9. *Canada's most vulnerable: improving health for First Nations, Inuit and Metis seniors*. Toronto (ON): Health Council of Canada; 2013.
10. Miller KJ, Couchie C, Ehman W, et al. Rural maternity care. *J Obstet Gynaecol Can* 2012;34:984-91.
11. Iglesias S, Grzybowski S, Klein MC, et al. Rural obstetrics. Joint position paper on rural maternity care. *Can Fam Physician* 1998; 44:831-43.
12. College of Family Physicians of Canada, Society of Rural Physicians of Canada, Society of Obstetricians and Gynaecologists of Canada. Joint position paper on training for rural family practitioners in advanced maternity skills and cesarean section. *Can Fam Physician* 1999; (45):2416-22.
13. Chiasson PM, Roy PD. Role of the general practitioner in the delivery of surgical and anesthesia services is rural western Canada. *CMAJ* 1995;153:1447-52.
14. Kornelsen J, McCartney K, McKeen M, et al. *Optimal perinatal surgical services for rural women: a realist review*. Vancouver (BC): Applied Policy Research Unit, Centre for Rural Health Research; 2014.
15. *A definition of a rural model of health service delivery: a hub and spoke model*. Brisbane, Queensland (Australia): Planning and Coordination Branch Policy, Planning and Asset Services Health Planning and Infrastructure Division, Queensland Government; 2010. Available: www.health.qld.gov.au/publications/infrastructure/documents/rural-model.pdf (accessed 2015 Sept. 6).
16. Wakerman J, Humphreys JS, Wells R, et al. Primary health care delivery models in rural and remote Australia: a systematic review. *BMC Health Serv Res* 2008;8:276.
17. Cancer Care Ontario. Provincial Primary Care and Cancer Network. 2014. Available: www.cancercare.on.ca/pcs/primcare/?WT.mc_id=/primarycare (accessed 2015 Sept. 6).
18. Sutcliffe SB. A review of Canadian health care and cancer care systems. *Cancer* 2011;117:2241-4.
19. Fainsinger R, Brenneis C, Fassbender K. Edmonton, Canada: a regional model of palliative care development. *J Pain Symptom Manage* 2007;33:634-9.
20. Craven MA, Bland R. Better practices in collaborative mental health care: an analysis of the evidence base. *Can J Psychiatry* 2006;51:7S-72S.
21. Gryzbowski S, Kornelsen J, Schuurman N. Planning the optimal level of local maternity service for small rural communities: a systems study in British Columbia. *Health Policy* 2009;92:49-157.
22. Iglesias S, Jones L. Rural surgical programs in western Canada. *Can J Rural Med* 2002;7:103-7.
23. *Cairns consensus statement on rural generalist medicine*. Shawville (QC): Society of Rural Physicians of Canada; 2014. Available: www.srpc.ca/PDF/CairnsConsensus.pdf (accessed 2015 Sept. 6).
24. Deutchman M, Connor P, Gobbo R, et al. Outcomes of cesarean sections performed by family physicians and the training they received: a 15-year retrospective study. *J Am Board Fam Pract* 1995;8:81-90.
25. Grzybowski S, Stoll K, Kornelsen J. The outcomes of perinatal surgical services in rural British Columbia: a population-based study. *Can J Rural Med* 2013;18:123-9.
26. Kornelsen J, Grzybowski S, Igleasias S. Is rural maternity care sustainable without general practitioner surgeons. *Can J Rural Med* 2006;11:218-20.
27. Stille J, Jerant A, Bell D, et al. Coordinating care across diseases, settings, and clinicians: a key role for the generalist in practice. *Ann Intern Med* 2005;142:700-8.
28. Aaraas I, Sorasdekkan H, Kristiansen IS. Are general practitioner hospitals cost-saving: evidence from a rural area of Norway. *Fam Pract* 1997;14:397-402.
29. Pashen D, Chater B, Murray R, et al. *The expanding role of the rural generalist in Australia — a systematic review*. Canberra (Australia): Australian Primary Health Care Research Institute; 2007.
30. Iglesias S, Strachan J, Ko G, et al. Advanced skills by Canada's rural physicians. *Can J Rural Med* 1999;4:227-31.
31. Grzybowski S, Kornelsen J, Cooper E. Rural maternity care services under stress: the experiences of providers. *Can J Rural Med* 2007; 12:89-94.
32. Heneghan SJ, Bordley J, Dietz PA, et al. Comparison of urban and rural general surgeons: motivations for practice location, practice patterns and education requirements. *J Am Coll Surg* 2005;201:732-6.
33. Breon TA, Scott-Conner CE, Tracy RD. Spectrum of general surgery in rural Iowa. *Curr Surg* 2003;60:94-9.
34. Campbell NA, Kitchen G, Campbell IA. Operative experience of general surgeons in a rural hospital. *ANZ J Surg* 2011;81:601-3.

35. Caron N, Iglesias S, Friesen R, et al. A proposed curriculum and evaluation for training rural family physicians in Enhanced Surgical Skills. *Can J Surg* 2015.
36. Webber E, McAlister VC, Gorman L, et al. The past and future of the generalist general surgeon. *Can J Surg* 2014;57:6-7.
37. Doty B, Zuckerman R. Rural surgery: framing the issues. *Surg Clin North Am* 2009;89:1279-84.
38. Thompson MJ, Lynge DC, Larson EH, et al. Characterizing the general surgery workforce in rural America. *Arch Surg* 2005;140:74-9.
39. Rourke JT. Trends in small hospital medical services in Ontario. *Can Fam Physician* 1998;44:2107-12.
40. Rourke J, Frank JR. Implementing the CanMEDSTM physician roles in rural specialist education: the multi-specialty community training network. *Rural Remote Health* 2005;5:406.
41. Humber N, Frecker T. Delivery models of rural surgical services in British Columbia (1996–2005): Are general practitioner–surgeons still part of the picture? *Can J Surg* 2008;51:173-8.
42. Humber N, Iglesias S. *Position paper on training for family physicians in general surgery*. 1999. Available: www.srpc.ca/PDF/training-general-surgery.pdf (accessed 2015 Sept. 6).
43. British Columbia Royal Commission on Health Care and Costs. Closer to home: the report of the British Columbia Royal Commission on Health Care and Costs. Vol. 1. 1991.
44. Hulme PA, Blegen MA. Residential status and birth outcomes: Is the rural/urban distinction adequate? *Public Health Nurs* 1999;16:176-81.
45. SOGC policy statement: returning birth to Aboriginal, rural, and remote communities. *JOGC* 2010;(251):1186-8.
46. Leeman L, Leeman R. A Native American community with a 7% caesarean delivery rate: Does mix, ethnicity, or labour management explain the low rate? *Ann Fam Med* 2003;1:36-43.
47. Leeman L, Leeman R. Do all hospitals need cesarean delivery capability? An outcomes study of maternity care in a rural hospital without on-site cesarean capability. *J Fam Pract* 2002;51:129-34.
48. Tucker J, Hundley V, Kiger A, et al. Sustainable maternity services in remote and rural Scotland? A qualitative survey of staff views on required skills: competencies and training. *Qual Saf Health Care* 2005;14:34-40.
49. Lynch N, Thommasen H, Anderson N, et al. Does having cesarean section capability make a difference to a small rural maternity service? *Can Fam Physician* 2005;51:1238-9.
50. Van Wagner V, Epoo B, Nastapoka J, et al. Reclaiming birth, health, and community: midwifery in the Inuit villages of Nunavik, Canada. *J Midwifery Womens Health* 2007;52:384-91.
51. Van Wagner V, Osepchook C, Harney E, et al. Remote midwifery in Nunavik, Québec, Canada: outcomes of perinatal care for the Inuulitsivik health centre, 2000–2007. *Birth* 2012;39:230-7.
52. Perinatal Services BC. *Forum on sustainability of rural maternity services.* Summary of March 1, 2014. Forum on Sustainability of Rural Maternity Services. Available: http://ess.rccbc.ca/wp-content/uploads/sites/5/2014/12/Sustainability-of-Rural-Surgical-Services-Combined-Summary-2014.pdf (accessed 2015 Sept. 6).
53. Klein M, Johnston S, Christilaw J, et al. Mothers, babies, and communities. Centralizing maternity care exposes mothers and babies to complications and endangers community stability. *Can Fam Physician* 2002;48:1177-9.
54. Urbach DR, Croxford R, MacCallum NL, et al. How are volume-outcome associations related to models of health care funding and delivery? A comparison of the United States and Canada. *World J Surg* 2005;29:1230-3.
55. Kornelsen J, Grzybowski S. Reality of resistance: the experiences of rural parturient women. *J Midwifery Womens Health* 2006;51:260-5.
56. Baker DK. Rural surgery in Canada. *World J Surg* 2006;30:1632-3.
57. Glazebrook RM, Harrison SL. Obstacles and solutions to maintenance of advanced procedural skills for rural and remote medical practitioners in Australia. *Rural Remote Health* 2006;6:502.
58. Humphreys JS, Jones MP, Jones JA, et al. Workforce retention in rural and remote Australia: determining the factors that influence length of practice. *Med J Aust* 2002;176:472-6.
59. Pollett W, Harris K. The future of rural surgical care in Canada: a time for action. *Can J Surg* 2002;45:88-9.
60. Swayne A, Eley DS. Synergy and sustainability in rural procedural medicine: views from the coalface. *Aust J Rural Health* 2010;18:38-42.
61. Kildea S, Van Wagner V. *"Birthing on country" maternity service delivery models: a review of the literature. An Evidence Check rapid review*. Haymarket NSW (Australia): Sax Institute; 2012.
62. Tracy S, Hartz D, Nicholl M, et al. An integrated services network in maternity — the implementation of a midwifery-led unit. *Aust Health Rev* 2005;29:332-9.
63. *Clinical services capability framework 3.1 — maternity services module*. Queensland Health; 2012.
64. Welch R, Power R. General practitioner obstetric practice in rural and remote Western Australia. *Aust N Z J Obstet Gynaecol* 1995;35:241-4.
65. Cameron B, Cameron S. Outcomes in rural obstetrics, Atherton Hospital 1991–2000. *Aust J Rural Health* 2001;9:S39-42.
66. Dooley J, Kelly L, St Pierre-Hansen N, et al. Rural and remote obstetric care close to home: program description, evaluation and discussion of Sioux Lookout Meno Ya Win Health Centre obstetrics. *Can J Rural Med* 2009;14:75-9.
67. *Rural surgical futures 2011–2021*. North Sydney NSW (Australia): New South Wales Ministry of Health: 2012.
68. Bar-Zeev JS, Barclay L, Farrington C, et al. From hospital to home: the quality and safety of a postnatal discharge system used for remote dwelling Aboriginal mothers and infants in the top end of Australia. *Midwifery* 2012;28:366-73.
69. Royal Australasian College of Surgeons. Training for GP surgical proceduralists. 2010. Available: www.surgeons.org/media/8524/FES_RSE_2360_P_Position_Paper_Training_for_GP_Surgical_Proceduralists.pdf (accessed 2015 Sept. 6).
70. Enhanced Recovery After Surgery (ERAS) Society [home page]. Available: www.erassociety.org (accessed 2015 Sept. 6).
71. Fearon K, Ljungqvist O, Meyenfeldt M, et al. Enhanced recovery after surgery: a consensus review of clinical care for patients undergoing colonic resection. *Clin Nutr* 2005;24:466-77.
72. Varadhan K, Lobo D, Ljungqvist O. Enhanced recovery after surgery: the future of improving surgical care. *Crit Care Clin* 2010;26:527-47.
73. Halm EA, Lee C, Chassin MR. Is volume related to outcome in health care: a systematic review and methodological critique of the literature. *Ann Intern Med* 2002;137:511-20.
74. Luft HS, Bunker JP, Enthoven AC, et al. Should operations be regionalized? The empiric relation between surgical volume and mortality. *N Engl J Med* 1979;301:1364-9.
75. Thanh N, Jacobs P, Wanke M, et al. Outcomes of the introduction of the MOREOB continuing education program in Alberta. *J Obstet Gynaecol Can* 2010;32:749-55.
76. Milne JK, Lalonde AB. Patient safety in women's health-care: professional colleges can make a difference. The Society of Obstetricians and Gynaecologists of Canada MORE(OB) program. *Best Pract Res Clin Obstet Gynaecol* 2007;21:565-79.
77. College of Family Physicians of Canada. Section of Communities of Practice in Family Medicine (CPFM). 2015. Available: www.cfpc.ca/CPFM (accessed 2015 Sept. 6).
78. Lave J, Wenger E. *Situated learning: legitimate peripheral participation.* Cambridge: Cambridge University Press. 1991.
79. Grzybowski S, Kornelsen J. Rural health services: finding the light at the end of the tunnel. Healthc Policy 2013;8:10-6.
80. Salus Global. MORE^{OB} [home page]. Available: www.moreob.com (accessed 2015 Sept. 6).
81. Salus Global. MORE^{OB}. The solution. Available: http://moreob.com/the-solution (accessed 2015 Sept. 6).
82. American College of Surgeons National Surgical Quality Improvement Program. Available: www.facs.org/quality-programs/acs-nsqip (accessed 2015 Sept. 6).

The occasional ectopic pregnancy

Taft Micks, MD
Kyle Sue, MD, CCFP
Discipline of Family Medicine, Faculty of Medicine, Memorial University of Newfoundland, St. John's, NL

Correspondence to:
Taft Micks;
mickstaft@gmail.com

This article has been peer reviewed.

CASE

An 18-year-old woman is brought into your rural emergency department by paramedics after collapsing at home. She is noted to be pale and diaphoretic. She reports severe abdominal pain and vaginal bleeding. Her blood pressure is 105/70 mm Hg, and her heart rate is 110 beats/min. Her abdomen is exquisitely tender. She had a positive home pregnancy test 8 weeks ago. You suspect an ectopic pregnancy. How would you manage this patient?

INTRODUCTION

Vaginal bleeding and pelvic pain during the first trimester of pregnancy are common presentations to the emergency department, with about 15%–20% of all pregnancies being complicated by vaginal bleeding.[1,2] Of these, 2.6% will be ectopic pregnancies, which are responsible for 6%–15% of maternal deaths in early pregnancy.[1,3] Thus, it is extremely important for physicians to accurately diagnose this condition. We will discuss tools used to diagnose intrauterine pregnancy (thereby excluding an ectopic pregnancy) and subsequent management of ectopic pregnancy in the rural emergency department.

HISTORY

Most patients with an ectopic pregnancy will present before rupture with nonspecific complaints, such as vaginal bleeding or abdominal/pelvic pain, with a history of amenorrhea, similar to patients presenting with a viable intrauterine pregnancy or miscarriage.[4,5] Thus, a high index of suspicion is warranted in these scenarios. Amenorrhea from 4 to 12 weeks from the last menstrual period is reported in 70% of ectopic pregnancies, but absence of amenorrhea is found in 15% of ectopic pregnancies.[6] Occasionally, if rupture has occurred, the patient may present with syncope, hypotension or hypovolemic shock. It is important to elicit risk factors for ectopic pregnancy, including (from strongest to weakest) previous tubal surgery, previous ectopic pregnancy, in utero diethylstilbestrol exposure, previous genital infections, infertility, current smoking and previous intrauterine device use.[7] However, more than half of women with an ectopic pregnancy will have no identifiable risk factors.[8]

PHYSICAL EXAMINATION

In a systematic review, Crochet and colleagues[3] listed the sensitivity (Sn), specificity (Sp), positive likelihood ratio (+LR) and negative likelihood ratio (–LR) for the following physical examination findings: cervical motion tenderness Sn 0.45, Sp 0.91, +LR 4.9, –LR 0.62; peritoneal findings Sn 0.25, Sp 0.95, +LR 4.4, –LR 0.8; adnexal tenderness Sn 0.09, Sp 0.96, +LR 2.4, –LR 0.94; adnexal mass Sn 0.61, Sp 0.65, +LR 1.9, –LR 0.57. Overall, the findings on physical examination are more specific than sensitive, so a normal examination cannot rule out an ectopic pregnancy.[3]

INVESTIGATIONS

A complete blood count should be ordered to assess for anemia secondary to acute blood loss, and a blood type and screen should be ordered to assess for Rh(D) status. All Rh(D)-negative

women should be given 300 μg of anti-D immune globulin to prevent alloimmunization.[6]

In cases of severe blood loss, a crossmatch of 2 to 4 units of packed red blood cells should be ordered, and coagulation testing may be required.

Use of β–human chorionic gonadotropin in ectopic pregnancy

Pregnancy can be confirmed with either a urine (qualitative) or serum (quantitative) β–human chorionic gonadotropin (HCG) test. A single serum β-HCG measurement cannot rule in or rule out an intrauterine pregnancy or ectopic pregnancy. Many clinicians are aware of the concept of the "discriminatory zone," but its clinical utility has been called into question. Above the values of 1500–3000 IU/L for transvaginal and 6500 IU/L for transabdominal ultrasound, an intrauterine pregnancy should be visualized. If an intrauterine pregnancy is not visualized and the β-HCG value is above the discriminatory zone, the clinician should be highly suspicious for an ectopic pregnancy. However, if the β-HCG is below the discriminatory zone and an intrauterine pregnancy is not visualized, the clinician should be just as suspicious for an ectopic pregnancy. Most symptomatic patients who present to an emergency department with ectopic pregnancy who have no visible intrauterine pregnancy on bedside ultrasonography have a β-HCG level below the discriminatory zone. Use of the discriminatory zone cutoffs for β-HCG achieves only 35% sensitivity, 58% specificity, a positive likelihood ratio of 0.82 and a negative likelihood ratio of 1.13 for ectopic pregnancy; this will not help with the exclusion of ectopic pregnancy as it will miss 65% of cases.[9–11] Therefore, when an intrauterine pregnancy cannot be confirmed on ultrasound, the use of the discriminatory zone is not helpful in differentiating between intrauterine pregnancy and ectopic pregnancy.

If the patient is stable and an intrauterine pregnancy cannot be confirmed with ultrasound, trending the β-HCG level every 48 hours is a more useful measurement. About 99% of viable intrauterine pregnancies will have an increase in β-HCG level of at least 53% in 48 hours. For women with ectopic pregnancy, half will have decreasing levels and half will have increasing levels of β-HCG; however, 71% of the women with increasing values will have levels that increase more slowly than expected in a viable intrauterine pregnancy.[6,12] It is important to realize that if the β-HCG has doubled, this does not necessarily rule out an ectopic pregnancy, although it is less likely.

IMAGING

Point-of-care ultrasonography

With point-of-care ultrasonography, the finding of an intrauterine pregnancy is considered a negative test for ectopic pregnancy, with sensitivity of 99.3%, a negative predictive value of 99.9% and a negative likelihood ratio of 0.08.[13] Thus, point-of-care ultrasonography is an appropriate screening test to exclude ectopic pregnancy and the single most important test in the workup. Although these values apply to transvaginal obstetric ultrasonography (which is the preferred method of ultrasonography in this scenario), the transabdominal approach is a good starting point and is more likely to be available in rural emergency departments. It may also be quickly used to assess for free fluid in the abdomen using focused assessment with sonography for trauma (FAST).[14] The primary goal for the occasional ultrasonography scan in a rural emergency department is to assess it safely. The key to safety is not the ability to call a scan positive or negative, but knowing when to call it inconclusive. If you are not sure, continue management as if you have not done a scan.[15]

EQUIPMENT

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

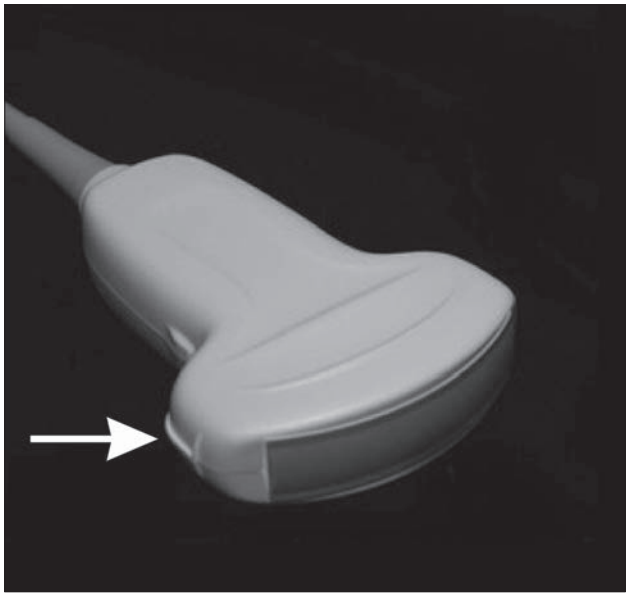


Fig. 1. Low frequency (2–5 MHz) curvilinear probe. The probe marker (white arrow) should always be pointed toward the patient's head (cephalad) or right side.

PROCEDURE

Begin with either the transverse or longitudinal view of the uterus when performing transabdominal obstetric ultrasonography (Fig. 2). The bladder appears as a fluid-filled hypoechoic (black) structure in the near field. A full bladder is optimal because it provides an acoustic window to visualize the uterus, as urine (fluid) conducts the ultrasound waves very well. The uterus appears as a solid structure visualized in the far field (bottom of the screen) immediately behind the bladder in the near field (top of the screen). The uterus is further identified by the hyperechoic (white) endometrial stripe (Figs. 3 and 4). To view the entire uterus, tilt the transducer from side to side.

INTRAUTERINE PREGNANCY

To identify an intrauterine pregnancy, first confirm bladder-uterine juxtaposition. This ensures that you are oriented toward the uterus and are not confirming a pregnancy within the adnexa. Confirmation of an intrauterine pregnancy requires visualization of all 3 of the following within the body of the uterus: 1) decidual reaction, 2) gestational sac and 3) yolk sac.[15] Identification of a fetal pole within the uterus absolutely confirms an intrauterine pregnancy.

Decidual reaction

At 2 weeks postfertilization, the endometrium undergoes a decidual reaction, formed by the decidua capsularis and decidua vera, which results in a strongly echogenic (white) lining around the gestational sac.[11]

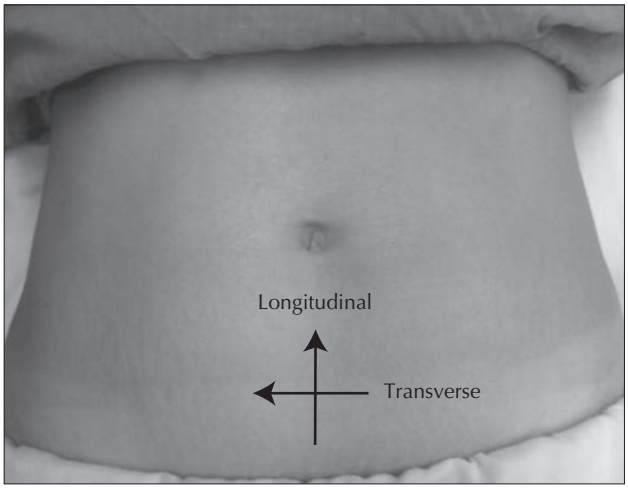


Fig. 2. Placement of the curvilinear probe to obtain transverse and longitudinal views of the uterus. The probe marker is pointed toward either the patient's right (transverse) or cephalad (longitudinal) direction (arrows).

Gestational sac

The gestational sac appears as a hypoechoic oval structure within the uterine fundus (Fig. 5). Early in pregnancy it may be difficult to differentiate the gestational sac of an intrauterine pregnancy from an endometrial cyst, hematoma, pseudogestational sac or blighted ovum, as they may all appear similar on ultrasonography.[11] A pseudogestational sac contains fluid in the endometrium and may occur in an ectopic pregnancy.[16] A blighted ovum should be suspected if the gestational sac is greater than 25 mm with no yolk sac visible and may occur in a nonviable pregnancy.[15]

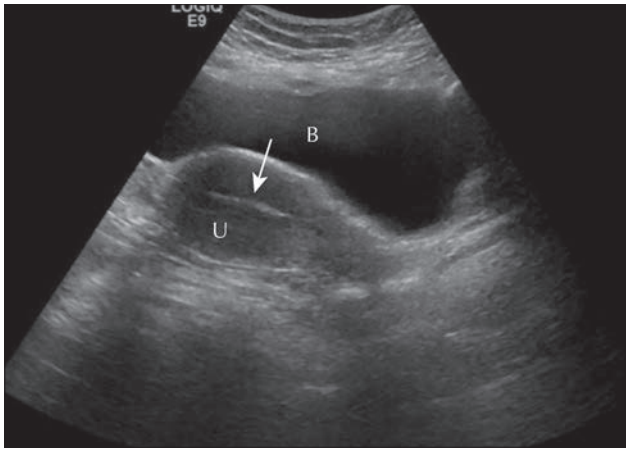


Fig. 3. Normal longitudinal view. The bladder (B) is the hypoechoic (black) fluid-filled structure seen in the near field with the uterus (U) directly posterior. The hyperechoic endometrial stripe (white arrow) can be visualized within the uterus.

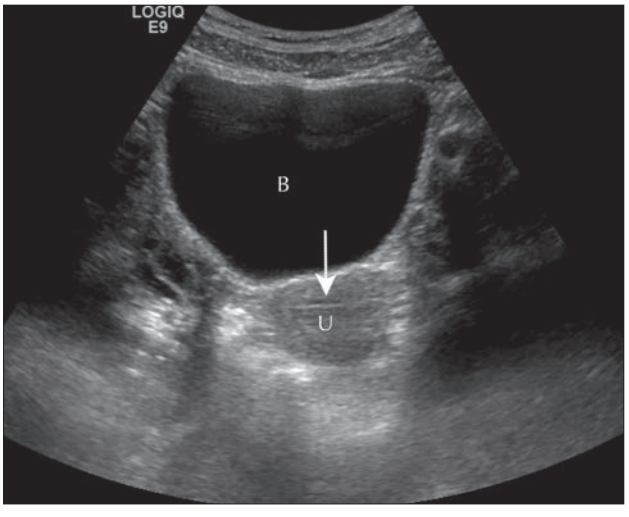


Fig. 4. Normal transverse view. The bladder (B) is the hypoechoic (black) fluid-filled structure seen in the near field with the uterus (U) directly posterior. The hyperechoic endometrial stripe (white arrow) can be visualized within the uterus.

Yolk sac

The yolk sac appears as an echogenic ring with an anechoic centre located within the gestational sac (Fig. 6). Identification of its presence within the gestational sac is the first definitive sign of an intrauterine pregnancy.[11] The yolk sac increases in size until week 10 and disappears by week 12.[17] A good way to remember this is to call this informally the "positive Cheerio sign."

Fetal pole

The fetal pole (or embryo) can be visualized next to the yolk sac around the fifth week of gestation.[11] It is a discoid mass of about 2 mm located within the gestational sac (Figs. 7 and 8). When the gestational sac grows to 18 mm, a visible fetal pole should always be seen.[18] At 6 weeks gestational age, cardiac activity is seen within the embryo. This can be visualized as a flickering area within the thorax of the fetal pole.

INDETERMINATE SCAN

If you are unable to confirm an intrauterine pregnancy, this may be deemed an indeterminate scan and can be documented as "no definitive intrauterine pregnancy." This will occur in about 30% of symptomatic first-trimester patients undergoing ultrasonography.[12] This may represent an early intrauterine pregnancy, embryonic demise, molar

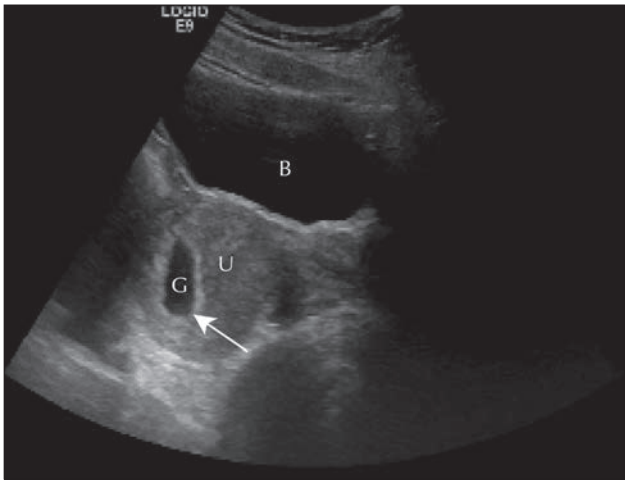


Fig. 5. Longitudinal view of the uterus (U) with decidual reaction (white arrow) and a visible gestational sac (G). The bladder (B) can be visualized in the near field.

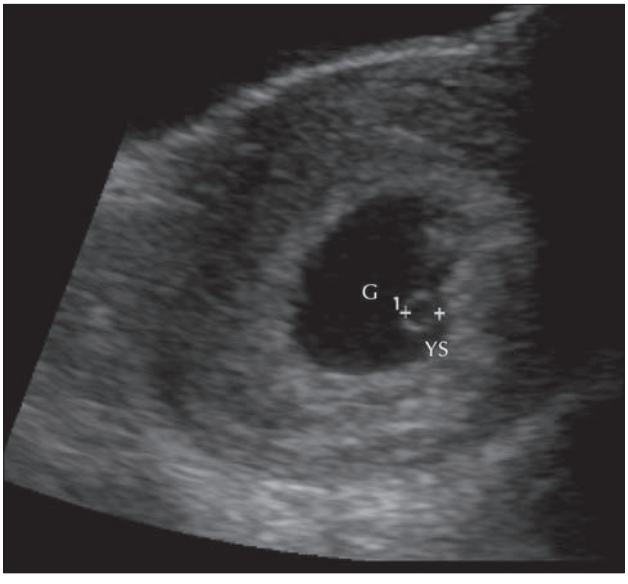


Fig. 6. The yolk sac (YS) can be seen within the gestational sac (G).

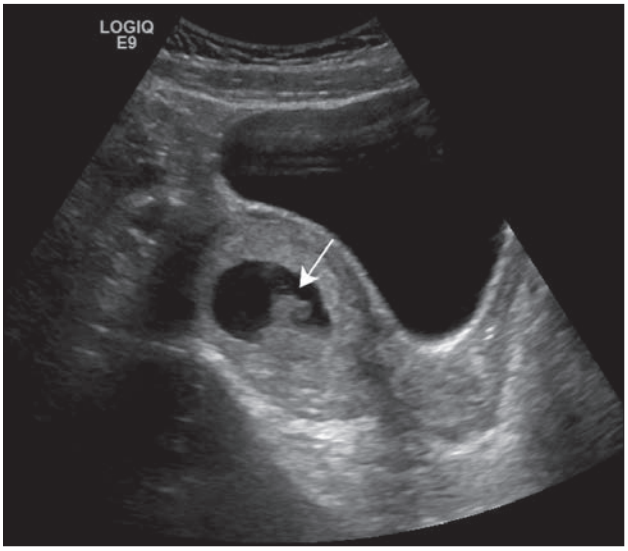


Fig. 7. Longitudinal view with visible fetal pole (arrow).

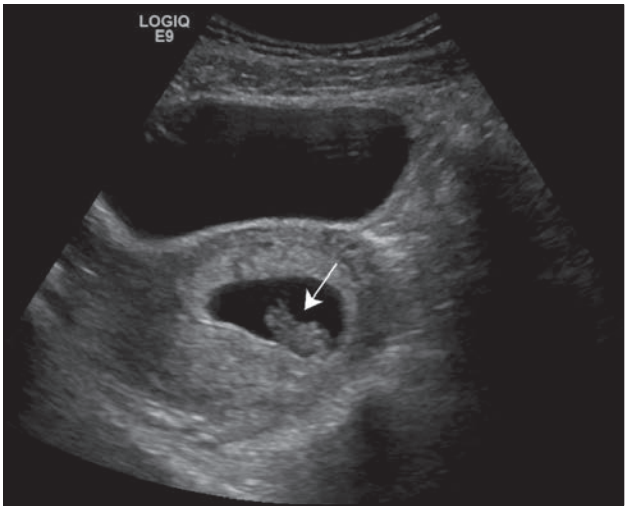


Fig. 8. Transverse view with visible fetal pole (arrow).

pregnancy or ectopic pregnancy. However, an ectopic pregnancy should be suspected until proven otherwise. Remember that all 3 criteria (mentioned in the "Intrauterine pregnancy" section) are required to confirm an intrauterine pregnancy, as well as confirming bladder-uterine juxtaposition. If only a gestational sac is visualized, this may represent a pseudogestational sac of an ectopic pregnancy. Therefore, the clinician must also confirm the presence of a decidual reaction and yolk sac, or a fetal pole within the gestational sac.

Heterotopic pregnancy

Increased caution is required for women undergoing fertility treatment, as the risk of heterotopic pregnancy is increased. The incidence of heterotopic pregnancy is about 1 in 30 000, but is as high as 1 in 3900 in women undergoing hormone-induced superovulation, intrauterine insemination or in vitro fertilization.[4] Thus, clinicians must have a higher index of suspicion for an ectopic pregnancy, even in the presence of an intrauterine pregnancy[12] (Fig. 9[6,7,14,15]).

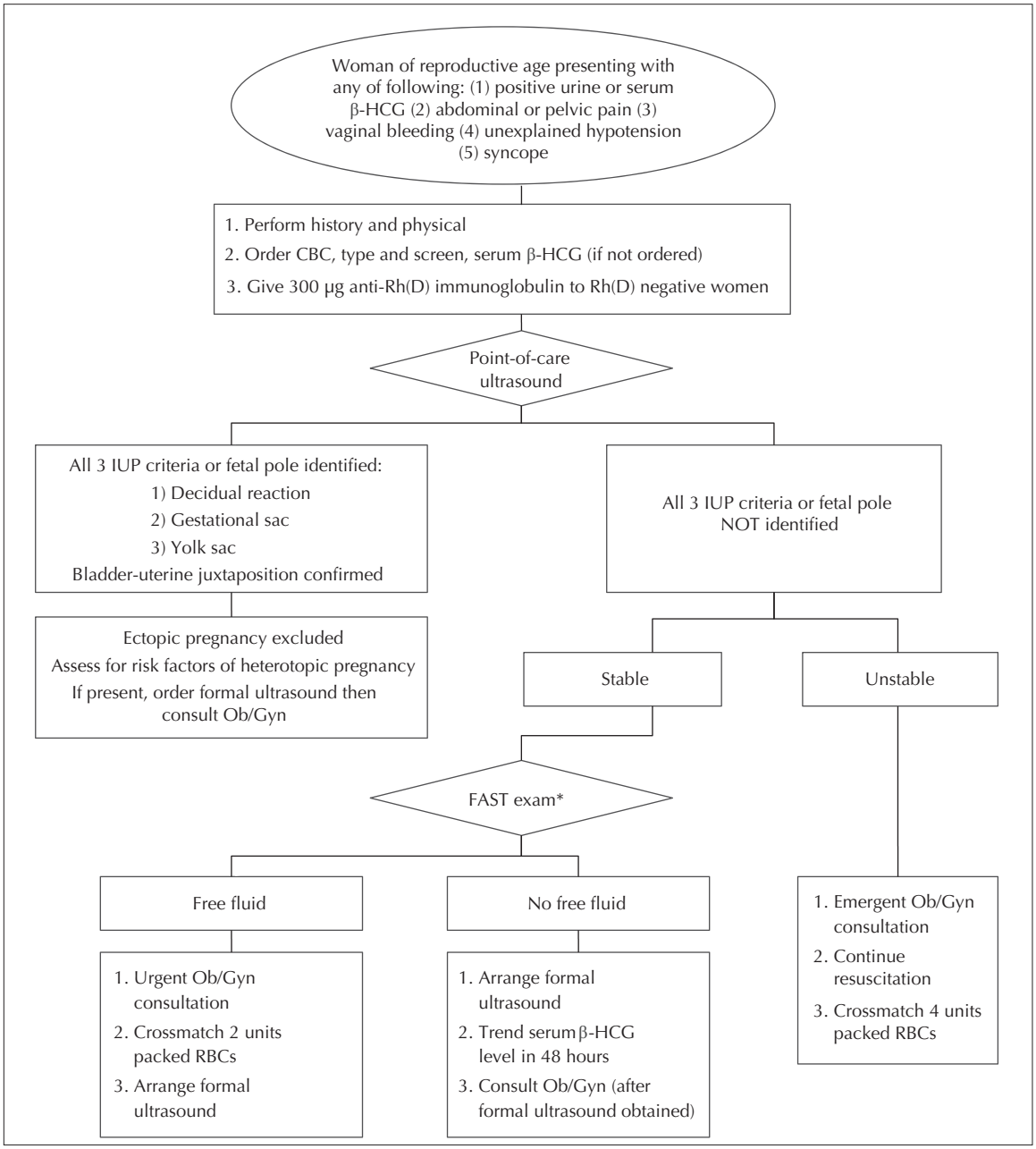


Fig. 9. Algorithm for management of ectopic pregnancy in the emergency department.[6,7,15] CBC = complete blood count; HCG = human chorionic gonadotropin; IUP = intrauterine pregnancy; Ob/Gyn = obstetrician–gynecologist; RBC = red blood cells. *For more information on how to perform a focused assessment with sonography for trauma (FAST) see Sue.[14]

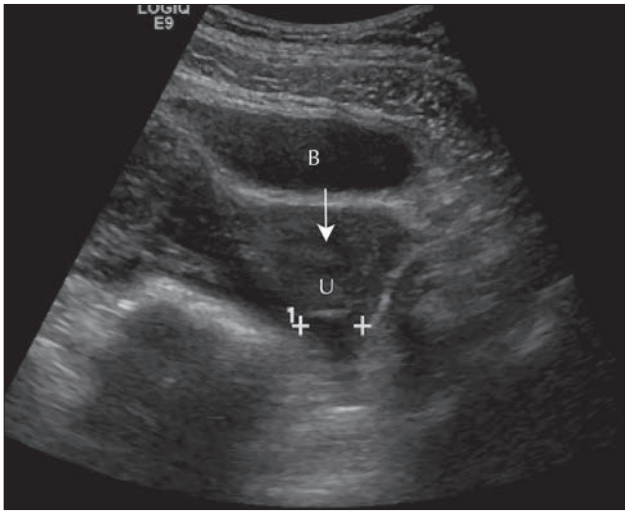


Fig. 10. Transverse view of the uterus (U), bladder (B) and endometrial stripe (white arrow). An intrauterine pregnancy cannot be confirmed. Free fluid is seen (+).

CASE 1 CONTINUED

Despite resuscitation, the patient's condition continues to deteriorate. Her blood pressure is now 80/55 mm Hg and heart rate is 135 beats/min. Her abdomen is distended. Ultrasonography of her pelvis (Fig. 10) reveals a uterus with no definitive intrauterine pregnancy. Free fluid can also be visualized. You immediately consult an obstetrician–gynecologist. The patient is taken to the operating room, where it is confirmed she has an ectopic pregnancy in her adnexa. She receives appropriate management and is discharged home within the next few days.

Acknowledgement: The authors thank the ultrasound technologists at the Central Newfoundland Regional Health Centre for their immense help in image generation.

Competing interests: None declared.

REFERENCES

1. Mazzariol FS, Roberts J, Oh SK, et al. Pearls and pitfalls in first-trimester obstetric sonography. *Clin Imaging* 2015;39:176-85.
2. Bennett G, Bromley B, Lieberman E, et al. Subchorionic hemorrhage in first-trimester pregnancies: prediction of outcome with sonography. *Radiology* 1996;200:803-6.
3. Crochet J, Bastian L, Chireau M. Does this woman have an ectopic pregnancy? The rational clinical examination systematic review. *JAMA* 2013 ;309:1722-29.
4. Sohoni A, Bosley J, Miss J. Bedside ultrasonography for obstetric and gynecologic emergencies. *Crit Care Clin* 2014;30:207-26.
5. Murtaza U, Ortmann M, Mando-Vandrick J, et al. Management of first-trimester complications in the emergency department. *Am J Health Syst Pharm* 2013;70:99-111.
6. Fung Kee Fung K, Eason E, Crane J, et al.; Maternal-Fetal Medicine Committee, Genetics Committee. Prevention of Rh alloimmunization. *J Obstet Gynaecol Can* 2003;25:765-73.
7. Lozeau AM, Potter B. Diagnosis and management of ectopic pregnancy. *Am Fam Physician* 2005;72:1707-14.
8. Stein JC, Wang R, Adler N, et al. Emergency physician ultrasonography for evaluating patients at risk for ectopic pregnancy: a meta-analysis. *Ann Emerg Med* 2010;56:674-83.
9. Wang R, Reynolds T, West H, et al. Use of β-HCG discriminatory zone with bedside pelvic ultrasonography. *Ann Emerg Med* 2011;58:12-20.
10. Layman K, Antonois M, Davis J. Pitfalls in emergency department focused bedside sonography of first trimester pregnancy. *Emerg Med Int* 2013:982318.
11. Soni N, Amtfield R, Kory P. First-trimester pregnancy. In: *Point-of-care ultrasound*. Philadelphia (PA): Elsevier; 2015. P. 184-198.
12. Barnhart KT. Clinical practice. Ectopic pregnancy. *N Engl J Med* 2009;361:379-87.
13. Stein JC, Wang R, Adler N, et al. Emergency physician ultrasonography for evaluating patients at risk for ectopic pregnancy: a meta-analysis. *Ann Emerg Med* 2010;56:674-83.
14. Sue K. The occasional ED ultrasound: focused assessment with sonography for trauma (FAST). *Can J Rural Med* 2015;20: 33-9.
15. Wiss R, Socransky S. *Point-of-care ultrasound for emergency physicians: "the EDE book"*. The EDE Course; 2012.
16. Nyberg DA, Mack LA, Harvey D, et al. Value of the yolk sac in evaluation early pregnancies. *J Ultrasound Med* 1988;7:129-35.
17. Nyberg DA, Laing FC, Filly RA, et al. Ultrasonographic differentiation of the gestational sac of early intrauterine pregnancy from the pseduogestational scan of ectopic pregnancy. *Radiology* 1983; 146:755-9.
18. Paspulati RM, Bhatt S, Nour S. Sonographic evaluation of first-trimester bleeding. *Radiol Clin North Am* 2004;42:297-314.

Country cardiograms case 55

Charles Helm, MD, CCFP
Tumbler Ridge, BC

Correspondence to: Charles Helm; helm.c.w@gmail.com

This article has been peer reviewed.

A 25-year-old man presents to a rural emergency department reporting profound weakness. He has trouble ambulating and struggles to raise his limbs while supine. He reports generalized muscle discomfort but no severe chest pain. He is not taking any prescription medications.

His blood pressure is 170/110 mm Hg; the rest of his vital signs are normal. As part of his investigations, blood tests are done and an electrocardiogram (ECG) is obtained (Fig. 1).

What is the ECG interpretation, and what is the most likely diagnosis?

For the answer, see page 146.

Competing interests: None declared.

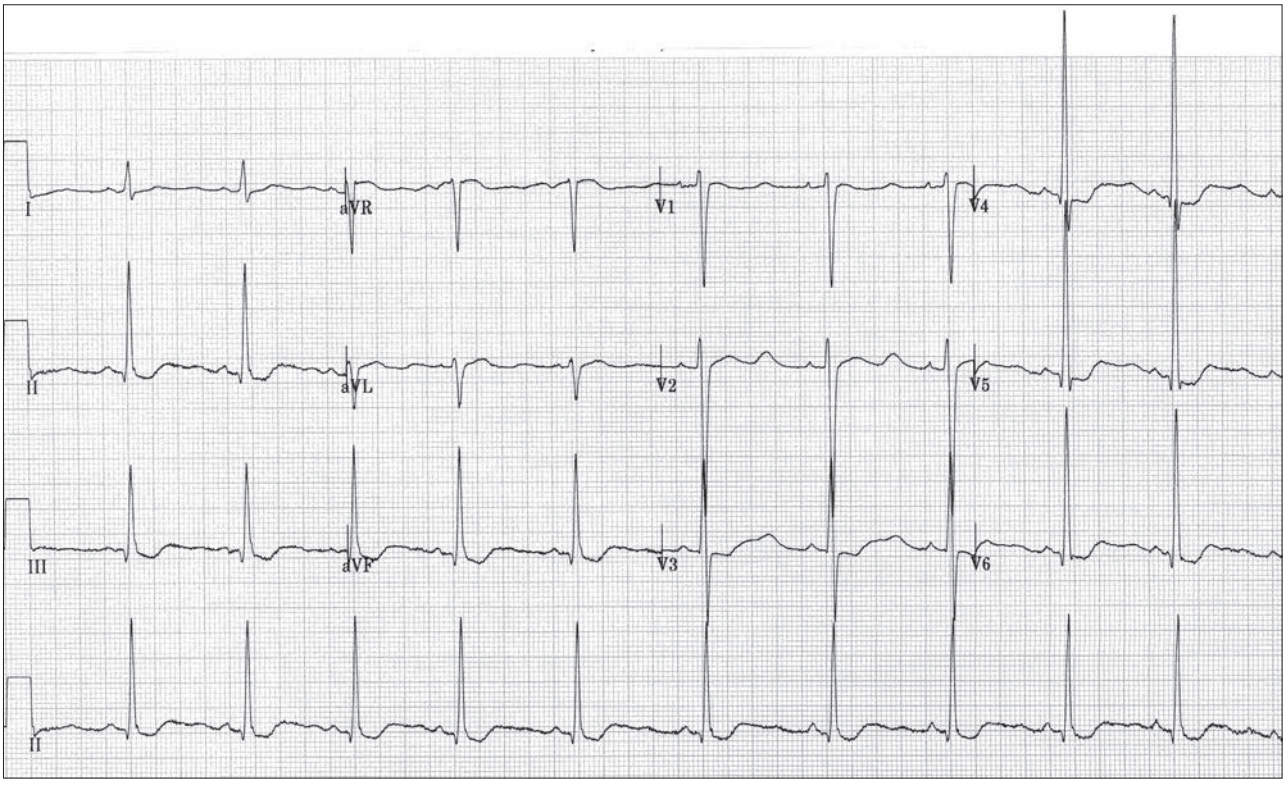


Fig. 1. Electrocardiogram of a 25-year-old man presenting to the emergency department with profound weakness.

Country cardiograms case 55: Answer

Charles Helm, MD, CCFP
Tumbler Ridge, BC

Slight sinus arrhythmia is present, with a mean rate of 65 beats/min. The PR interval is normal (0.16 s). The QRS duration is at the top end of normal (0.105 s), the QT interval is normal (0.40 s) and the QRS axis is normal (80°). The P wave morphology is normal; there is no evidence of left atrial abnormality. High QRS voltage is present (S wave of 30 mm in lead V2, R waves of 34 mm in lead V5 and 22 mm in lead II). Down-sloping ST segment depression is present in inferior leads II, III and aVF, and precordial leads V2–V6. The T waves are flattened, and very prominent U waves are present in leads V1–V5.

The abnormal features on this electrocardiogram (ECG) include high QRS voltage, down-sloping ST segment depression, flat T waves and prominent U waves.

Although left ventricular hypertrophy (LVH) is a common cause of high QRS voltage, caution is warranted when diagnosing this based on voltage criteria alone, especially in younger patients with thin chest walls. The presence of left atrial abnormality, left axis deviation, secondary ST–T changes or a wide QRS complex would make a diagnosis of LVH more likely and form the basis for the Romhilt–Estes scoring criteria. In this case, the voltage, in addition to the slightly wide QRS complexes and the ST segment changes, prompt consideration of LVH, supported by the hypertension noted on examination. Caution should be exercised in diagnosing this with certainty, however, considering the patient's young age.

The causes of ST segment depression include secondary changes to LVH or bundle branch block; ischemia; medications, such as digoxin; and hypokalemia. In this case, LVH or hypokalemia would be the most likely causes.

Small U waves are often a normal phenomenon, but the large U wave amplitude in this case is unusual and suggests hypokalemia. The flat T waves, rather than the inverted T waves that are often seen secondary to LVH, further raise the suspicion for hypokalemia.

Electrocardiogram diagnosis in this case suggests hypokalemia and possible LVH.

This patient's serum potassium level was 1.5 (normal 3.5–5.1) mmol/L, with associated alkalosis and hyponatremia, and an elevated creatine kinase level. Hypertension in a young person raises the possibility of secondary causes, and hypertension combined with profound hypokalemia (in the absence of diuretic therapy) suggests hyperaldosteronism. Further screening investigations in this case suggested primary hyperaldosteronism, with a grossly elevated aldosterone-to-renin ratio of greater than 7400 (normal < 1500) pmol/L per ng/L/s.

In an urgent situation such as this, the 12-lead ECG potentially provides a rapid diagnosis, enabling appropriate intravenous potassium therapy to be prepared while awaiting serum potassium results.

The "teapot" memory aid may be useful: "no pot, no T" (low potassium levels often produce T wave flattening). If U waves are present, they may be mistaken for T waves, leading to pseudolengthening of the QT interval. If the QT interval seems long, consider hypocalcemia, but also consider the U waves of hypokalemia as a cause.

For the question, see page 145.

Competing interests: None declared.

Rural medicine across the border: one medical student's perspective

Lindsay Dolomount, BSc
Faculty of Medicine, Memorial University of Newfoundland, St. John's, NL

Correspondence to: Lindsay Dolomount; lad171@mun.ca

This article has been peer reviewed.

In the fall of 2014, as a second-year medical student, I had the opportunity to complete consecutive rural family medicine placements in Canada and the United States. I spent 2 weeks in Twillingate, NL, and then flew south to spend 4 weeks in Latrobe, Pa. I set out on this adventure to discover whether differences exist between Canada and the US in the delivery of rural health care. I was curious about how differences in the health care systems would be reflected in the day-to-day experiences of patients and health professionals in rural communities.

In Twillingate I discovered the traditional model of family medicine at its finest. Twillingate is a small island community located off the northern coast of central Newfoundland. The community hospital is a 49-bed facility serving a population of about 6000 people. Five family physicians practise at the hospital; there are no local physician specialists. The family physicians often have the experience of admitting a patient from the emergency department, caring for them as an inpatient and later following them on an outpatient basis. The continuity of care patients receive in this treatment model is second to none.

Whereas patients in Twillingate receive very high-quality emergent and primary care, there are significant barriers to accessing tertiary care services. Wait times for specialist consultations are often lengthy and patients have difficulty travelling to other areas of the province to access these services. There is also a severe shortage of long-term care facilities to meet the needs of the aging population. Many patients in acute care in the Twillingate hospital have been medically discharged and are awaiting a placement in a nursing home facility.

Latrobe is a community of about 8000 people in western Pennsylvania. Family physicians practising at the Latrobe Hospital are responsible for seeing inpatients in addition to managing busy outpatient clinics. Patients in Latrobe receive excellent continuity of care, similar to the care I observed in Twillingate. The most noticeable difference between Twillingate and Latrobe is the availability of tertiary care services. In the 188-bed hospital in Latrobe a variety of medical and surgical specialty services are offered. I was pleasantly surprised to learn there were several nursing homes and long-term care facilities in the area. Financial challenges were a more common barrier to accessing care than wait times.

Although the differences I observed between Canada and the US were intriguing, what I found most remarkable were the similarities in my experiences. I found rural family medicine similar in both locations for its variety, the breadth of knowledge required, and the development of meaningful physician–patient relationships. I also found common health issues to be very similar in Twillingate and Latrobe. In both locations I encountered many patients with chronic diseases related to obesity, substance use and aging. Although there were significant differences in the tertiary care services available (one morning in Latrobe I shadowed a surgical procedure using the da Vinci robotic surgery system, and I knew for sure I was no longer in Twillingate), I discovered the common health issues in both areas were most effectively tackled with

primary care. Even with the most advanced technologies and highly trained specialists, chronic disease prevails in North America. At the end of the day, preventative medicine may be the most powerful tool we can use to increase longevity and improve the quality of life of our patients.

The physicians I worked with in both locations expressed similar reasons for which they enjoyed practising family medicine. They felt rewarded in rural practice for the opportunities to play big roles in small communities. I shared their joys of rural medicine during my brief experience. I was surprised to discover the connection I felt with these 2 communities after spending only a few weeks in each location. In both areas I was welcomed by the kindness and humanity of the people I met. The physicians I worked with were eager to teach, and the students I met were excited to socialize. Above all, I was humbled by the kindness of patients who allowed me to learn from them. I was surprised to discover how easily I could form a relationship with a patient whom I knew very little about, in a community I had only just arrived in.

As I reflect on my experiences, one particular conversation with a physician has stuck with me. Dr. Mohamed Ravalia, who practises in Twillingate, explains the connection he feels with his community as the reason he has enjoyed nearly 30 years of rural family practice:

> Fundamentally for me, it is the community. I feel very privileged to have ended up in a place like this that is at the end of the road, that has a very defined sense about itself. This is a place where people can trace their roots back, 3 or 4 generations. There is a sense of pride and ownership, there is a sense of altruism and caring. There is a very defined and strong sense of spirituality, and despite centuries of adversity, these communities have survived. So there is a sense of resilience here that is palpable.

Acknowledgement: The author acknowledges the Dr. Andrew David Bagby Scholarship program for the opportunity to experience family medicine in Latrobe, Pa.

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

Instructions for Authors

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)

Commentary: editorials, regional reviews and opinion pieces (1500 words or less)

Clinical articles: practical articles relevant to rural practice. llustrations 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

Manuscript submission

Submit an electronic version to cjrm@cjrm.net. Digital art and photos must accompany the manuscript in separate files (see "Electronic figures and illustrations"). The mailing address, if needed for artwork or other reasons, is as follows: Suzanne Kingsmill, Managing Editor, *CJRM*, P.O. Box 22015, 45 Overlea Blvd., East York ON M4H 1N9. Fax: 416 961-8271. Please do not send anything by courier because they will not deliver to a post office box.

The manuscript should be double-spaced, with a separate title page containing the authors names and titles and a word count, an abstract of no more than 200 words (for original articles category), followed by the text, full references and tables (each table on a separate page). Reference marks should be typed in the text and enclosed by brackets <1> and listed in the order of appearance at the end of the text and not prepared using electronic EndNotes or Footnotes. The approved style guide for the manuscript is the "Uniform requirements for manuscripts submitted to biomedical journals" (see www.cmaj.ca/site/authors/policies.xhtml).

Include a covering letter from the corresponding author indicating that the piece has not been published or submitted for publication elsewhere and indicate the category in which the article should be considered. Please provide the name and contact information of a potential independent reviewer for your work.

Electronic figures and illustrations

Illustrations should be in JPG, EPS, TIFF or GIF formats as produced by the camera at a minimal resolution of 300 dpi (typically a 2 mega pixel or better camera for 10 × 15 cm image). Do not correct colour or contrast as our printer will do that. Do not include text or captions in the image. If you need to crop the picture ensure that you save with the highest quality (lowest compression). Do not scan art or reduce the resolution of the photos unless you indicate in the cover letter that you have done so and will also be forwarding high resolution copies on either CD or as camera ready art.

Written permissions

Written permission must be provided for the reproduction of previously published material, for illustrations that identify human subjects, and from any person mentioned in the Acknowledgements or cited as the source of a Personal Communication.

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 – Barriere. Family physician to join private clinic starting Oct. 5, 2015. Clinic with an attached ER and laboratory and x-ray open during office hours. Doctors rotate call. ER patients seen in between regular office bookings; between one and ten ER patients a day. Very supportive MOAs. Med Access EMR. Own private office with two examination rooms. Office hours – Monday to Friday, 8:30 am to 17:30 pm. Remuneration – fee-for-service; estimated gross income $300,000+/-. Incentives under the Rural Subsidiary Agreement. Relocation funding available as per IHA policy. The community of Barriere is located 66 km north of Kamloops where all the conveniences of a city can be found. Barriere is a great choice for outdoor enthusiasts since it is close to lakes, rivers and ski hills. View detailed posting at Web site www.betterhere.ca or contact email physicianrecruitment@interiorhealth.ca for more information. –RM-338

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 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 PHYSICIAN: BC – Nakusp. Seeking a permanent family physician for a general rural practice to work with a private clinic group at the Saddle Mountain Medical Clinic. The office is modern with excellent staff. EMR is Wolf Telus. Physicians share after-hour coverage through an on-call schedule, working approximately one-in-four. The hospital has six acute care beds, 20 extended care beds and a well-equipped, fully functioning emergency department providing 24/7 medical care. Strong collegial support between physicians allows for work/life balance. Remuneration is fee-for-service; gross income estimated at $300,000+/-. Rural incentives and benefits available. For more information email physicianrecruitment@interiorhealth.ca or view online at Web site www.betterhere.ca –RM-337

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


CHECK YOUR OWN PULSE FOR A CHANGE
FIND A JOB IN BC
health match bc
Photo: Eric Berger
healthmatchbc.org
A free health professional recruitment service funded by the Government of British Columbia (BC), Canada
RM-339

Society of Rural Physicians of Canada

Upcoming Courses for The Rural Emergency & Enhanced Surgical Skills Physician

MONTRÉAL 2015
at Hôtel Delta Montréal

BANFF 2016
at The Rimrock Resort Hotel

OPHTHALMOLOGY AND SLIT LAMP USE, MONTRÉAL
December 10th 2015

Four Hours of Learning and Hands-on:

- Identify the essential components of and use of a slit lamp
- Understand the basic diagnosis and treatment of eye infections and trauma
- Proper assessment of the cornea and anterior chambermber
- Develop rational guidelines for referral
- and more . . .

Info/register: srpc.ca/rcc2015

ENHANCED SURGICAL SKILLS PROGRAM, BANFF
January 21st (evening) & 22nd 2016

This course is designed for GPS / ESS Surgeons in conjunction with U of C Emergency Medicine for Rural Hospitals.

- ***Robert Taylor*** International Surgery: Need and Opportunities for GPS
- ***Richard Simons*** Surgical First Responders
- ***Andrew Kotaska*** Assisted Vaginal Birth
- and more . . .

*Special invitation to Rural OR Nurses

- Reduced registration
- Bursary available

Info/register: srpc.ca/ess2016

PLASTICS TECHNIQUES MONTRÉAL
December 8th (evening) & 9th 2015

PLASTICS TECHNIQUES BANFF
January 21st 2016

Designed for the Family Physician and Emergency Physician who sees complex lacerations and hand injuries on an intermittent basis. The Course will be a mixture of didactic and hands-on.

- Understand the importance of proper equipment and material selection
- Understand the principles of temporary closures for complex wounds
- Vertical and Horizontal Mattress Suture and the Corner Suture
- Suture wounds with more confidence
- Learn advanced techniques, flaps
- Understand the basic principles of hand injury and fingertip care
- and more . . .

Info/register: srpc.ca/rcc2015

Info/register: srpc.ca/rcc2016

www.srpc.ca

Society of Rural Physicians of Canada
Société de la Médecine Rurale du Canada