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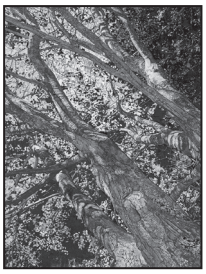

Morning Maple
Watercolour on yupo paper, 21"×16"
by Josy Britton, SCA, CSPWC
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"The Canadian landscape has profoundly impacted my life and work. I turn to nature for rejuvenation, inspiration and invigoration. The Look Way Up Series was conceived on a wilderness canoe trip in Temagami after an intense portage."
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Certificate of Added Competence for Enhanced Surgical Skills — it's about our privileges

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Rural surgical and maternity care rests on a platform of family physicians with Enhanced Surgical Skills (ESSs). These provide skill sets in both operative delivery and broader general surgery procedures. Privileging for these ESSs is, arguably, the single largest roadblock threatening the sustainability of these surgical and operative delivery programs.

Family physicians applying for privileges for surgical procedures face deep, strongly held skepticism from specialist surgeons about the quality of the training and the competence of the graduates. Privileging authorities are looking for a credential that verifies these 2 points. Without this credential, local medical directors are faced with unpackaging the list of procedures, examining the training, procedure by procedure, and seeking validation of competency from local surgical specialists. This process invites discord, is highly variable and is very challenging for medical directors.

In our view, the appropriate credential for privileging the ESS skill set is elevation of ESSs to a Category 1 program (e.g., Family Practice Anesthesia, Emergency Medicine) and the awarding of a Certificate of Added Competence (CAC) to its graduates. This pathway requires collaboration among the 2 colleges and the specialty societies to define ESS competencies, create a national competency-based curriculum, design evaluation methodologies, implement a high-level accreditation process to examine the training provided and verify the competence of graduates. This would deliver the credential appropriate to the privileging for ESSs.

The CAC is a formal certifying process that confirms successful training in an appropriately accredited Category 1 program. This is a confirmatory credential, with a visible and highly intuitive flagstaff declaration, that assures national training standards and competence from its recipients.

The present College of Family Physicians of Canada template anticipates that CAC(ESS) would be attainable going forward only by completing an accredited Category 1 program. Although all who are in current practice will have a practice-eligible route to a CAC (grandparenting), that door has closed very quickly with the other CACs, which do not have a formal exit examination.

In a workforce that has relied on international medical graduates rather than Canadian-trained ESS graduates for most of its members, it is likely that the positive contribution from a CAC to resolving privileging will miss a large part of its intended application. *The unintended consequences might be worse.* Faced with a new credential — a Canadian CAC(ESS) — and being somewhat disenchanted as a result of the unresolved issues with their historical credentialling review for foreign trainees, the privileging authorities might decline to privilege any new international medical graduate applicants. This is a strong case for maintaining a practice-eligible route, through a formal assessment rather than an examination, to a CAC for surgical training acquired outside the Canadian Category 1 programs. The survival of the small rural surgical and maternity care programs may depend on the preservation of this practice-eligible route.

Certificat de compétence additionnelle — compétences avancées en chirurgie : des privilèges menacés

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Les soins chirurgicaux et obstétricaux en région rurale reposent sur les épaules de médecins de famille possédant des compétences avancées en chirurgie (CAC). Il s'agit de compétences qui leur permettent de procéder à des accouchements chirurgicaux et à d'autres interventions de chirurgie générale. L'octroi des privilèges qui se rattachent aux CAC est vraisemblablement la plus importante menace à la viabilité des programmes qui couvrent les chirurgies, obstétricales et autres.

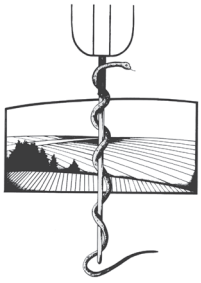
Les médecins de famille qui réclament les privilèges rattachés à des interventions chirurgicales font face à un scepticisme bien ancré chez les chirurgiens spécialistes, qui doutent de la qualité de la formation et des compétences des diplômés. Or, les autorités qui accordent ces privilèges souhaitent pouvoir se fier à une accréditation qui vérifie ces deux éléments. Sans une telle accréditation, les directeurs médicaux locaux se voient obligés de dresser une liste des interventions, d'examiner chaque intervention comprise dans la formation et d'avoir recours à des spécialistes chirurgicaux locaux pour valider les compétences recherchées. Cette approche est propice aux conflits, laisse place à l'interprétation et est très éprouvante pour les directeurs médicaux.

Selon nous, l'accréditation appropriée pour octroyer les privilèges qui se rattachent à l'ensemble des CAC consisterait à intégrer ces dernières à un programme de catégorie 1 (p. ex., anesthésie ou médecine d'urgence pour la pratique de la médecine familiale) et à remettre un certificat de compétence additionnelle (CCA) aux diplômés. Cette voie requiert une collaboration entre les deux collèges et les sociétés spécialisées pour définir les CAC, créer un programme national fondé sur les compétences, élaborer des méthodes d'évaluation, mettre en œuvre un processus d'agrément de haut niveau pour valider la formation offerte, ainsi que vérifier les compétences des diplômés. Une telle accréditation serait appropriée pour l'octroi des privilèges qui se rattachent aux CAC.

Le CCA est un processus d'agrément formel confirmant la réussite d'une formation dans le cadre d'un programme de catégorie 1. Il s'agit d'une accréditation de confirmation, reposant sur une attestation centralisée, visible et très intuitive, qui garantit la conformité des professionnels agréés aux normes nationales en matière de formation et de compétences.

Selon le modèle actuel du Collège des médecins de famille du Canada, le CCA (CAC) pourrait à l'avenir être obtenu seulement en effectuant un programme de catégorie 1 agréé. Même si tous les médecins actuellement en exercice bénéficieront d'une voie de la reconnaissance des acquis pour obtenir un CCA (droits acquis), cette porte s'est refermée très rapidement pour les autres certificats de compétence additionnelle, qui ne sont pas associés à un examen final formel.

Étant donné que notre main d'œuvre est composée en majeure partie de diplômés de médecine internationaux plutôt que de diplômés en CAC formés au Canada, il est probable que la contribution favorable d'un CCA pour résoudre le problème d'octroi des privilèges passera largement à côté de l'application escomptée. *Or, les conséquences non prévues pourraient être encore pires*. Forcées de s'en remettre à une nouvelle accréditation — soit un CCA (CAC) canadien — et déjà déçues par l'incapacité à résoudre les problèmes relatifs à la reconnaissance des acquis des stagiaires étrangers, les autorités responsables de l'octroi des privilèges pourraient refuser d'en attribuer à de nouveaux candidats venus de l'étranger. Il serait donc de loin préférable de maintenir une voie pour reconnaître les acquis, au moyen d'une évaluation formelle plutôt que d'un examen, pour permettre aux personnes ayant suivi une formation chirurgicale hors des programmes canadiens de catégorie 1 d'obtenir un CAC. La survie des programmes chirurgicaux et obstétricaux des petites communautés rurales pourrait dépendre du maintien de la reconnaissance des acquis.



President's message. A better world?

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I love the RuralMed Listserv. Lately there have been some fascinating exchanges on laboratory testing, public versus private medicine and family medicine efficiency. I particularly liked Paul Mackey's response on Aug. 10 to an article describing some of the inadequacies of family practice in British Columbia.[1] Paul outlines the frustrations he encountered during a somewhat typical day, which we all can relate to. Both Paul's response and the article that he addressed carry a very serious message that, in my curmudgeonly interpretation, points to a trend in the general population toward a lack of caring about others.

It had long been my understanding that part of the responsibility of owning a business was not only to provide a service or commodity to your customers but also to provide employment to a portion of the population. The major banks in Canada, which are earning profits in the billion-dollar range per quarter, are still reducing their workforces to increase their bottom lines. Sears is currently going through bankruptcy, which has allowed them to not only terminate their employees without the usual benefits but also deprive them of their retirement benefits. At the same time, the company's decision-makers get hefty bonuses. Even on the medical side, we are guilty of the same thinking. We feel success if we can eliminate a $30 000 employee so that we can increase our 6-figure incomes. My daughter works at a large radiography clinic in a major urban centre, where recently there were a number of layoffs to increase profitability. The resulting shortage of technical staff led to an inability to clean the equipment for the recommended time period. The response of the management: "Don't spend so much time cleaning it."

In our family practices, continuity of care is sacrificed for "work–life balance." This has led to emergentologists, hospitalists, minor emergency clinics and a raft of other episodic care arrangements (including in obstetrics and palliative care). I don't think it has improved care for patients.

Society in general seems to have lost the desire to serve others, and, instead, there is a tendency to attend to our own desires first. For me, and I suspect for many of my rural physician colleagues, serving others is where my personal and professional satisfaction was rooted. I mourn the loss of this perspective when I go to a bank, shop at a department store or need to deal with the myriad of clerks/colleagues who insist on having the patient's height and weight on the orders for an IV or the CT done before they will see the patient.

A better world?

REFERENCE

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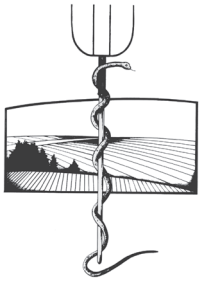

Message du président. Un monde meilleur?

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J'adore la liste de distribution de RuralMed. On y a récemment assisté à des échanges fascinants sur les analyses de laboratoire, la médecine publique c. la médecine privée et l'efficience de la médecine familiale. J'ai particulièrement apprécié la réponse de Paul Mackey le 10 août à un article sur les failles de la médecine familiale en Colombie-Britannique[1]. Paul y résumait les frustrations d'une journée de travail typique et nous pouvions tous nous y reconnaître. Tant l'article que la réponse de Paul véhiculent un message qui, à mon humble avis, témoigne d'un manque de compassion envers son prochain dans la population en général.

J'ai toujours cru qu'une partie de la responsabilité qui revient aux propriétaires d'entreprise était non seulement d'offrir un service ou des biens à sa clientèle, mais également de fournir de l'emploi aux membres de la communauté environnante. Les grandes banques du Canada, dont les profits se chiffrent en milliards de dollars par trimestre, continuent de réduire leurs effectifs pour accroître leurs bénéfices. Sears est actuellement en faillite, ce qui a permis à l'entreprise non seulement de mettre à pied ses employés sans les prestations d'usage, mais de les priver aussi de leurs régimes de retraite. En même temps, ses dirigeants ont obtenu des bonus plus que généreux. Et même du côté de la médecine, nous nous rendons coupables de fonctionner de la même façon. Nous avons l'impression de réussir si nous pouvons couper un salaire de 30 000 $ pour pouvoir engraisser nos revenus à « 6 chiffres ». Ma fille travaille dans une importante clinique de radiologie d'un grand centre urbain, où il y a eu plusieurs mises à pied récemment pour accroître la profitabilité. La pénurie de personnel technique qui en résulte a fait en sorte que la désinfection de l'équipement n'a pas été faite selon les intervalles recommandés. La réponse de la direction? « Passez moins de temps à désinfecter ».

Dans nos pratiques familiales, la continuité des soins se voit sacrifiée à l'autel de la « conciliation travail–famille ». Cela a donné lieu à divers arrangements de soins ponctuels prodigués par des urgentologues, des hospitalistes et des médecins des cliniques d'urgences mineures et autres (y compris dans les soins obstétricaux et les soins palliatifs). Je ne crois pas que les soins aux patients se soient ainsi améliorés.

En général, la société semble avoir perdu son désir de servir autrui, et on note à la place une tendance à rechercher l'autosatisfaction. À mon sens, et pour beaucoup de mes collègues médecins en milieu rural, j'imagine, c'est en servant autrui que l'on tire le plus de satisfaction personnelle et professionnelle de son travail. Cette perspective me manque lorsque j'entre dans une banque, dans un grand magasin ou lorsque je dois affronter une myriade de commis ou collègues qui insistent pour obtenir la taille et le poids d'un patient sur les requêtes pour un prélèvement sanguin ou une radiographie avant d'accepter de le voir.

Un monde meilleur, vraiment?

RÉFÉRENCE

1. Family medicine must improve [éditorial]. *Times Colonist* [Victoria]. Le 29 juillet 2017. Accessible ici, en anglais : www.timescolonist.com/opinion/editorials/editorial-family-medicine-must-improve-1.21455710 (consulté le 2017 Aug. 28).

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Original Article
Article original

Epidemiologic features of invasive group A *Streptococcus* infection in a rural hospital: 6-year retrospective report and literature review

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This article has been peer reviewed.

Introduction: High rates of invasive group A *Streptococcus* disease were suspected by clinicians in northwestern Ontario. Patients with sepsis were being encountered with bacteremia positive for group A *Streptococcus*. This study was designed to assess the incidence of invasive group A *Streptococcus* infection in the region and provide best-practice treatment information.
Methods: We performed a retrospective chart review at the Sioux Lookout Meno Ya Win Health Centre (SLMHC) from 2009 to 2014 to examine rates of infection due to invasive group A *Streptococcus* and outcomes. All blood cultures from 2015 were also examined to calculate the relative rates of distinct pathogens responsible for cases of bacteremia. A literature review on this topic was performed, with attention to rural incidence where available and clinical practice guidelines.
Results: Invasive group A *Streptococcus* disease was diagnosed in 65 patients during the study period. Most (37 [57%]) had bacteremia without a clinical focus. Type 2 diabetes mellitus was a comorbid condition in 27 (42%) and skin conditions in 30 (46%). The case fatality rate was 4.6%. In 2015, group A *Streptococcus* accounted for 8% of all positive blood cultures from in- and outpatients in the catchment area. The calculated annual incidence rate of invasive group A *Streptococcus* infection was 37.2 cases per 100 000 population.
Conclusion: Rural physicians may encounter group A *Streptococcus* bacteremia in their practice. The death rate associated with these infections can be as high as 20%, and patients require urgent treatment, typically with intravenous penicillin and clindamycin therapy. The rate of invasive group A *Streptococcus* infection in the predominantly First Nations population served by the SLMHC exceeded the Canadian rate eightfold and is comparable to rates observed in low-income countries and among Indigenous populations in Australia. This disparity may result from inadequate housing, overcrowding or limited access to clean water.

Introduction : Des cliniciens soupçonnaient des taux élevés d'infections invasives à streptocoque du groupe A dans le Nord-Ouest de l'Ontario. Les patients infectés présentaient une bactériémie positive pour les streptocoques du groupe A. Notre étude visait à évaluer l'incidence des infections invasives à streptocoque du groupe A dans la région et à offrir des renseignements sur les meilleures pratiques de traitement.
Méthodes : Nous avons mené une étude rétrospective des dossiers de patients du Centre de santé Meno Ya Win de Sioux Lookout (SLMHC) entre 2009 et 2014 afin d'étudier les taux d'infections invasives à streptocoque du groupe A et les résultats. Nous avons également examiné toutes les hémocultures effectuées en 2015 afin de déterminer les taux relatifs de pathogènes distincts responsables des cas de bactériémie. Nous avons procédé à une analyse documentaire sur le sujet, en portant attention à l'incidence en milieu rural lorsque les données étaient disponibles ainsi qu'aux guides de pratique clinique.

Résultats : Soixante-cinq patients ont reçu un diagnostic d'infection invasive à streptocoque du groupe A pendant la période à l'étude. La plupart d'entre eux (37 [57 %]) présentait une bactériémie sans manifestation clinique. Vingt-sept (42 %) patients présentaient également un diabète de type 2 et 30 (46 %) patients présentaient des affections cutanées. Le taux de mortalité clinique était de 4,6 %. En 2015, les infections à streptocoque du groupe A comptaient pour 8 % de la totalité des hémocultures positives provenant des patients hospitalisés et des patients externes dans la région à l'étude. On a calculé un taux d'incidence annuel d'infections invasives à streptocoque du groupe A de 37,2 cas par 100 000 personnes.

Conclusion : Les médecins en milieu rural peuvent rencontrer des cas de bactériémie à streptocoque du groupe A dans le cadre de leur pratique. Le taux de mortalité associé à ces infections peut atteindre 20 %. Les patients ont besoin d'un traitement urgent, reposant généralement sur l'administration de pénicilline et de clindamycine par voie intraveineuse. Le taux d'infections invasives à streptocoque du groupe A dans la population majoritairement autochtone desservie par le SLMHC était 8 fois plus élevé que le taux observé dans la population canadienne et est comparable aux taux observés dans les pays à faible revenu et chez les populations aborigènes d'Australie. Cette disparité pourrait être attribuable au logement inadéquat, au surpeuplement ou à l'accès limité à de l'eau potable.

INTRODUCTION

Streptococcal disease caused by the Lancefield group A *Streptococcus* (*S. pyogenes*) is a common occurrence in clinical practice, often presenting as common "strep throat" or impetigo. Group A *Streptococcus* is also associated with 2 autoimmune-mediated diseases that can follow simple infections: poststreptococcal glomerulonephritis and acute rheumatic fever.[1,2] More serious disease may occur when the streptococcal infection becomes invasive (Fig. 1).

Housing and access to clean water are among ongoing inequities in social determinants of health in many First Nations communities and are of particular relevance in the context of infectious diseases. In Australia, inadequate sanitation and overcrowding in Indigenous communities are associated with increased risk of infection, with group A *Streptococcus* being a predominant pathogen.[3,4]

We suspected that northwestern Ontario has a substantial burden of illness related to group A *Streptococcus*, as we have previously documented high rates of acute rheumatic fever[5] and poststreptococcal glomerulonephritis[6] in the region.

In this study, we report on the scope of invasive group A *Streptococcus* infections seen in a rural northwestern Ontario hospital and provide a summary of the relevant literature.

METHODS

Retrospective chart review

The Sioux Lookout Meno Ya Win Health Centre (SLMHC) in northwestern Ontario serves a primarily First Nations population. Its catchment area

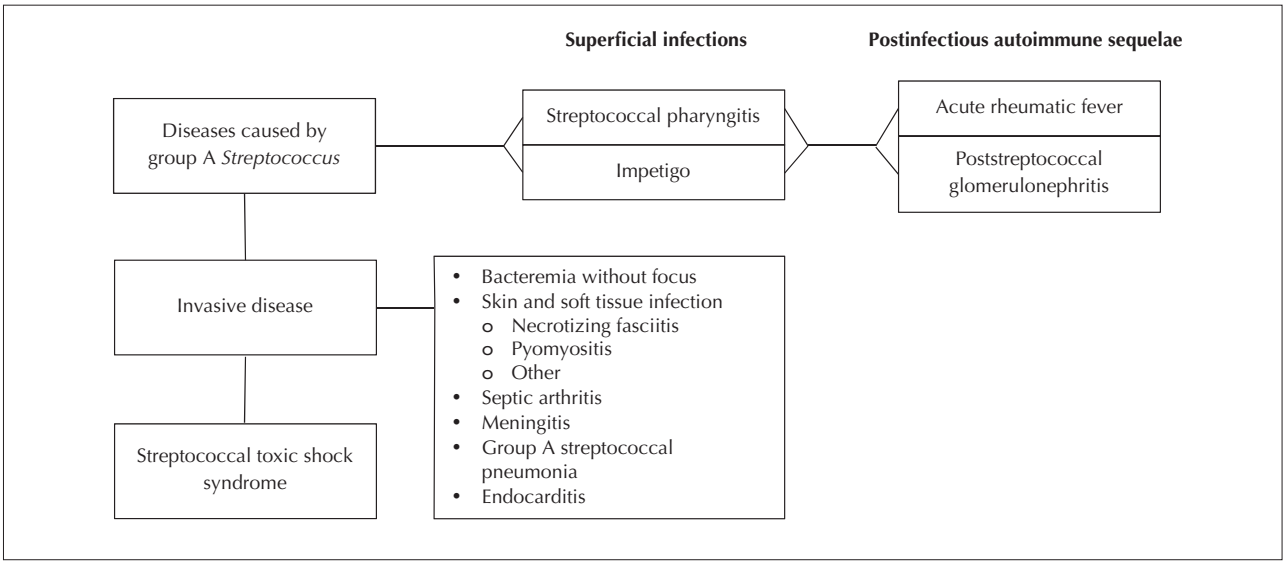

Fig. 1. Group A streptococcal diseases.

includes 31 remote fly-in communities across an area of 385 000 km^2. We used microbiology data from the SLMHC laboratory from Jan. 1, 2009, to Dec. 31, 2014, to identify potential cases of invasive group A *Streptococcus* infection. Case definition followed the Ontario guidelines[7] (Table 1). For each confirmed case, we recorded the patient demographic characteristics and disposition, and information relating to comorbidities and other risk factors.

We also collected laboratory data for all positive bacteremia results in 2015 in order to compare the epidemiologic features of invasive group A *Streptococcus* infection to those of other invasive infections treated at the same institution.

Data were input and analyzed with the use of Microsoft Excel.

Literature review

We conducted a search of the English-language literature from January 2005 to February 2016 using MEDLINE and Embase. Combinations of the following search terms were used: "*Streptococcus pyogenes*," "bacteremia," "arthritis, infectious," "cerebrospinal fluid," "peritoneal," "shock, septic," "fasciitis, necrotizing," "pyomyositis," "gangrene," "meningitis, bacterial," "death," "Canada," "Indians, North American," "Oceanic ancestry group," "rural health services," "rural population" and "rural health."

Ethics approval

This research was approved by the Sioux Lookout Meno Ya Win Research Review and Ethics Committee.

Table 1: Key definitions

Term	Definition
Confirmed case of invasive group A *Streptococcus* infection	Isolation of group A *Streptococcus* from a normally sterile site; *or* isolation of group A *Streptococcus* from a nonsterile site *and* evidence of clinical severity
Evidence of clinical severity	Any of the following: streptococcal toxic shock syndrome, necrotizing fasciitis, myositis, pyomyositis, gangrene, meningitis, group A streptococcal pneumonia (cannot be used as sole marker), presence of another life-threatening condition, death directly attributable to invasive group A *Streptococcus* infection
Streptococcal toxic shock syndrome	Hypotension plus 2 of the following: renal function impairment, coagulopathy, liver function abnormality, acute respiratory distress syndrome, generalized erythematous macular rash

RESULTS

Epidemiologic features in northwestern Ontario

In 2015, the SLMHC collected 106 positive blood culture isolates from 100 in- and outpatients. Duplicate and repeat cultures for the same patient were not included. Group A *Streptococcus* bacteremia accounted for 8% of the positive blood cultures (Fig. 2).

In the analysis of cultures positive for group A *Streptococcus* from 2009 to 2014, we identified 65 cases that met the case definition for invasive disease. Of the 65 patients, 48 were from remote First Nations communities north of Sioux Lookout, and 17 were from Sioux Lookout and Pickle Lake. The annual number of cases over the study period ranged from 6 to 14. No temporal or geographic clustering of cases was identified. The average annual incidence for the study period was 37.2 cases per 100 000 population.

Of the 65 cases, 34 (52%) were in females, and the mean age of all patients was 42.2 years (Table 2). The age distribution was bimodal, peaking among those aged less than 1 year and again among those aged 40–59 years (Fig. 3). Fifteen cases (23%) met the criteria for clinically severe infection. The most common comorbidities were skin conditions (30 patients [46%]) and diabetes mellitus (27 [42%]). Use of nonsteroidal anti-inflammatory drugs (NSAIDs) was the most common risk factor (17 patients [26%]) (Table 2).

Sixty-three cases (97%) were diagnosed based on the isolation of group A *Streptococcus* from a sterile site, typically blood (53 cases [82%]) (Table 3).

Bacteremia without focus was the most common clinical presentation (37 cases [57%]), followed by skin and soft-tissue infections (18 [28%]). Other presentations are listed in Table 4. Streptococcal toxic shock syndrome (STSS) developed in 3 of the 6 patients with necrotizing fasciitis and 4 of the 37 with nonfocal bacteremia.

Twenty-nine patients (45%) were transferred to a tertiary care centre for treatment. Three deaths directly attributable to invasive group A *Streptococcus* infection occurred during the study period, giving a case fatality rate of 4.6% (Table 5).

Literature summary

Definition

In Ontario, invasive group A *Streptococcus* infection is a provincially reportable disease. The case

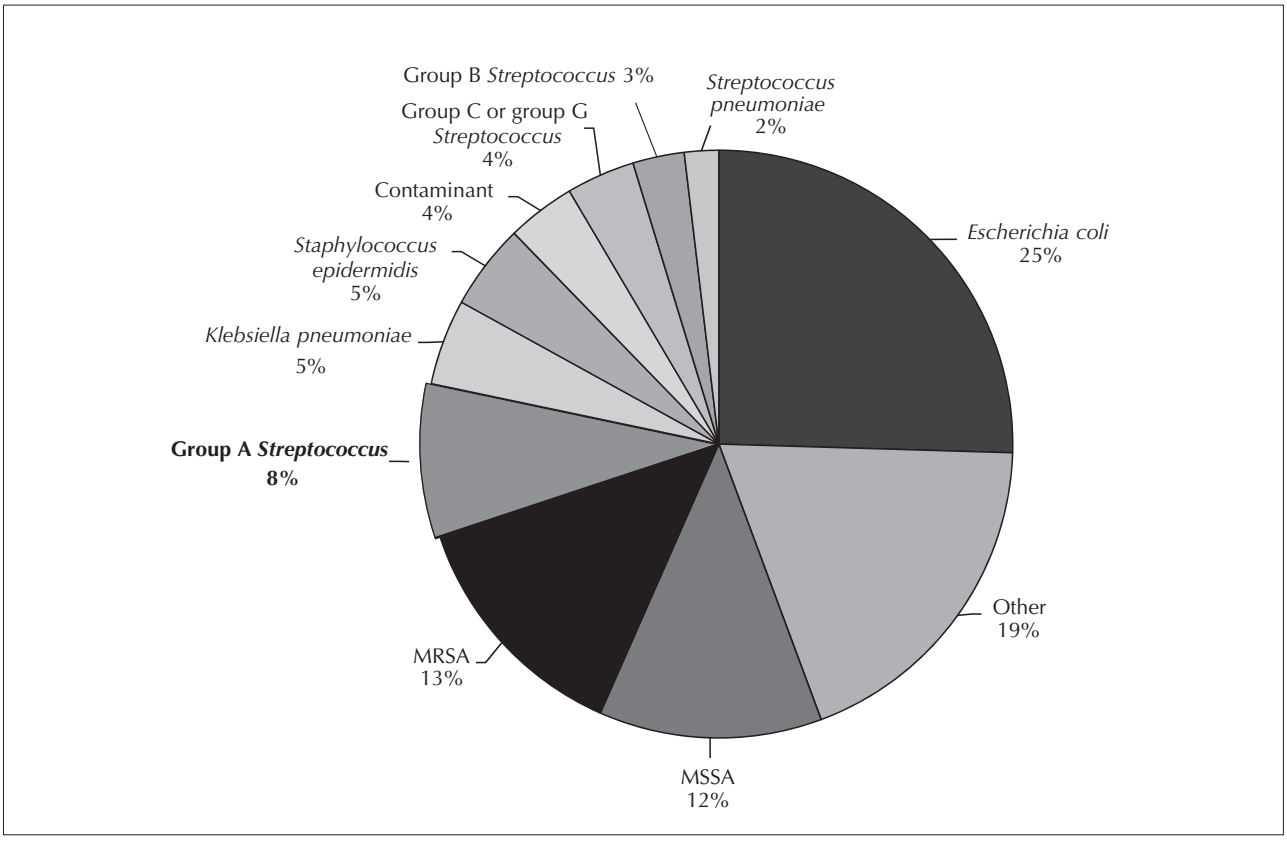

Fig. 2. Isolates from positive blood cultures from in- and outpatients at the Sioux Lookout Meno Ya Win Health Centre in 2015. Note: MRSA = methicillin-resistant *Staphylococcus aureus*, MSSA = methicillin-sensitive *S. aureus*.

Table 2: Characteristics of patients presenting with invasive group A *Streptococcus* infection to SLMHC between 2009 and 2014

Characteristic	No. (%) of patients* *n* = 65
Age, mean ± SD, yr	42.2 ± 24.9
Female	34 (52)
Clinically severe infection	15 (23)
Comorbid condition(s)	
Skin condition	30 (46)
Diabetes mellitus	27 (42)
Alcohol dependence	13 (20)
Coronary artery disease	8 (12)
Chronic renal failure	7 (11)
Risk factor(s)	
Use of nonsteroidal anti-inflammatory drug	17 (26)
Staphylococcus aureus cogrowth on current wound swab	14 (22)
Previous wound swab positive for group A *Streptococcus*	13 (20)
Previous diagnosis of invasive group A *Streptococcus* infection	5 (8)
Immunosuppressive drug use	4 (6)
Injection drug use	4 (6)

SD = standard deviation, SLMHC = Sioux Lookout Meno Ya Win Health Centre.
*Unless indicated otherwise.

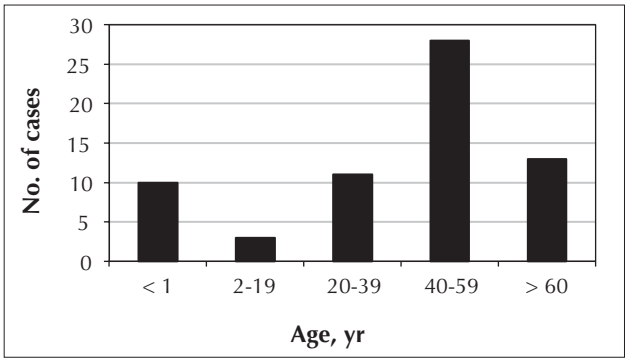

Fig. 3. Age at presentation of cases of invasive group A *Streptococcus* infection seen at the Sioux Lookout Meno Ya Win Health Centre between 2009 and 2014.

Table 3: Source of group A *Streptococcus* isolates from patients presenting to SLMHC between 2009 and 2014

Source	No. (%) of patients
Sterile site	63 (97)
Blood	53 (82)
Synovial fluid	4 (6)
Deep tissue (obtained during surgery)	3 (5)
Abscess (aseptic aspiration)	3 (5)
Peritoneal fluid	1 (2)
Cerebrospinal fluid	1 (2)

SLMHC = Sioux Lookout Meno Ya Win Health Centre.

definition includes cultures positive for group A *Streptococcus* obtained from a normally sterile site (e.g., blood, cerebral spinal fluid, deep tissue)[8,9] or the isolation of group A *Streptococcus* from a nonsterile site with evidence of clinical severity.[7] Clinical severity is determined based on evidence of STSS, necrotizing fasciitis, myositis, meningitis or group A streptococcal pneumonia.[7] However, pneumonia should not be used as a sole indicator of severity.[7]

Epidemiologic features

The highest incidence rates of invasive group A *Streptococcus* infection are typically reported among young (≤ 5 yr) and older (> 70 yr) patients.[10–12] Predisposing factors for this infection include diabetes, immunosuppression, malignant disease, varicella infection, intravenous drug use, alcohol abuse, skin trauma and NSAID use.[8,13–15]

The global incidence of invasive group A *Streptococcus* infection has been increasing since the mid-1980s.[10,16–19] In Canada, the incidence increased from 2.86 per 100 000 population in 2004 to 4.72 per 100 000 population in 2013.[20]

The highest reported incidence rates of invasive group A *Streptococcus* infection are associated with Indigenous communities in Australia, with rates of 23.8–82.5 per 100 000 population.[21,22] A recent 14-year study of the incidence of this infection in Australia showed that, although Indigenous patients constituted less than 10% of the study population, they accounted for 53% of cases of bacteremia due to group A *Streptococcus*.[23]

Table 4: Clinical presentation of invasive group A *Streptococcus* infections

Presentation	No. (%) of patients
Bacteremia without focus	37 (57)
Skin and soft-tissue infection	
Necrotizing fasciitis	6 (9)
Pyomyositis/myositis	2 (3)
Other	10 (15)
Septic arthritis	4 (6)
Deep-tissue infection	2 (3)
Meningitis	1 (2)
Group A streptococcal pneumonia	1 (2)
Endocarditis	1 (2)
Other	1 (2)

Table 5: Disposition and outcomes of patients with invasive group A *Streptococcus* infection

Disposition/outcome	No. (%) of patients
Transferred care	29 (45)
Treated locally	
Inpatient	32 (49)
Outpatient	4 (6)
Death due to invasive group A *Streptococcus* infection	3 (5)

Clinical manifestations

Streptococcal toxic shock syndrome

A diagnosis of STSS requires hypotension as well as the presence of at least 2 of renal impairment, coagulopathy, liver function abnormality, adult respiratory distress syndrome or generalized erythematous macular rash.[11,24,25] The clinical course of STSS can be rapidly progressive, with death rates as high as 56%.[26–34]

Streptococcal toxic shock syndrome may develop in 5.0%–28.6% of patients with invasive group A *Streptococcus* infection.[10–12,16,22,29,31,35] Patients with necrotizing fasciitis appear to be at greatest risk (50%).[36–39] Treatment of STSS often includes combination therapy with penicillin/clindamycin, as the latter is a protein synthesis inhibitor and may therefore reduce toxin production.[8,12,16,40] Intravenous immunoglobulin treatment may also be of benefit in some patients.[27,39,41]

Necrotizing fasciitis

A total of 3.6%–21.8% of cases of invasive group A *Streptococcus* infection present as necrotizing fasciitis.[11,13,16,28,36,37,42–45] This disorder presents nonspecifically and is difficult to diagnose initially.[42,46,47] Severe pain, disproportionate to external appearance, is characteristic.[48] Necrotizing fasciitis due to group A *Streptococcus* is associated with young and otherwise healthy patients[47] and often affects the lower extremities.[41,42,49]

Timely and extensive débridement is associated with better outcomes.[40–42,48] Volume resuscitation, intravenous antibiotic therapy and intravenous immunoglobulin therapy may also be important components of treatment; clindamycin may inhibit toxin production.[39,41] Death rates range from 16% to 50%.[11,13,16,28,39,42,49–51]

Meningitis

Group A streptococcal meningitis is the presence of isolates positive for group A *Streptococcus* in cerebrospinal fluid, or clinical and biochemical signs of meningitis accompanying group A streptococcal bacteremia.[18] Up to 5% of cases of invasive group A *Streptococcus* infection are meningitis,[14,18,28,32] but the

pathogen is a rare cause of bacterial meningitis (1%).[52,53] Group A streptococcal meningitis has a high mortality rate (23%–50%).[14,18,54] Neurologic sequelae develop in almost half of survivors,[18] a higher proportion than with other forms of meningitis.[53]

Other manifestations

The most common manifestation of invasive group A *Streptococcus* infection is bacteremia without focus (up to 27% of cases).[11,12,14,28,32,33,36] Other infection profiles include septic arthritis (4%–15%)[11,14,28,32,55] and pneumonia (10%).[14,32,35,44] Nonnecrotizing skin and soft-tissue infections are also common, occurring in 20%–30% of cases.[16,33,36,56]

Treatment

Treatment for invasive group A *Streptococcus* bacteremia consists of high-dosage penicillin and clindamycin given intravenously for 14 days (Table 6). Surgical and intensive care support may also be needed. Canadian guidelines recommend chemoprophylaxis for close contacts of people with confirmed severe cases. Close contact is defined as more than 4 hours of household contact per day, sharing the same bed, having sexual relations, direct mucous membrane contact or sharing needles with an infected person.[57] First-generation cephalosporins and erythromycin are recommended as first-line chemoprophylaxis for contacts. In addition, all close contacts should be counselled about the signs and symptoms of group A *Streptococcus* infection and should be advised to seek medical attention if signs and symptoms develop within 30 days after exposure.[58]

DISCUSSION

The average annual incidence rate of invasive group A *Streptococcus* infection in our rural population was 37.2 cases per 100 000 population, with a case fatality rate of 4.6%. This incidence is 8 times higher than the 2013 Canadian rate, 4.7/100 000 person-years, and 7 times the 2014 Ontario rate.[20,59] It is comparable to rates observed in low-income countries[60–62] and among Indigenous populations in Australia.[21,22] Our findings are consistent with previous research at our institution showing disproportionately high rates of other infectious diseases, such as methicillin-resistant *Staphylococcus aureus* infection,[63,64] and autoimmune sequelae of group A *Streptococcus* infection including acute rheumatic fever,[5] poststreptococcal glomerulonephritis[6] and pyomyositis.[65]

In February 2016, the Nishnawbe Aski Nation declared a health and public health emergency in response to the high burden of preventable diseases, including invasive bacterial infections, in remote First Nations communities in the Sioux Lookout region.[66] Overcrowded housing and inadequate access to clean water, factors known to facilitate the spread of communicable disease, exist in many of these communities and may help explain the high rates of infectious disease in the region.[5,6,63–65,67]

Pre-existing skin conditions were common in our study, occurring in 46% of patients with invasive group A *Streptococcus* infection. This raises the possibility that, in this population, skin may serve as an entry point for more invasive disease. Type 2 diabetes was also common (42%). Our age distribution was bimodal, with the second peak occurring in a younger age bracket (40–59 yr) than documented in the literature (> 70 yr).[10–12] The prevalence of type 2 diabetes may have contributed to the observed earlier onset of invasive group A *Streptococcus* infection.

Use of NSAIDs is associated with increased risk of STSS[68] and necrotizing fasciitis.[69,70] Use of these drugs may facilitate the seeding of damaged muscle tissue by *Strep. pyogenes*, exacerbate pre-existing group A *Streptococcus* infection and reduce the effectiveness of antibiotic therapy.[71] In our study, 26% of patients reported antecedent NSAID use, a proportion comparable to that in a New Zealand chart review on necrotizing fasciitis.[72]

Compared to previous studies, the case fatality rate of 4.6% reported here is low. Death rates for invasive group A *Streptococcus* infection typically range from 10%–20%.[14,19,21,28,35,36,61,62,73] There is a lack of consensus in the literature on how to define case fatality rate. The definition of death associated with invasive group A *Streptococcus* infection includes in-hospital death[16,36] and death within 7 days,[9,19,28,33,50,51] 28 days[23] or 30 days[32] of infection. The definition that we used was death known to be directly attributable to inva-

Table 6: Treatment for group A streptococcal bacteremia[25]

Population	Antibiotic and dosage	Duration, d
Adult	Penicillin G, 4 million units intravenously every 4–6 h, *and* clindamycin, 900 mg intravenously every 6–8 h	14
Child	Penicillin, 200 000–400 000 units/kg per day intravenously divided every 4–6 h (maximum 24 million units/d), *and* clindamycin, 20–40 mg/kg intravenously divided every 6–8 h (maximum 2.7 g/d)	14
Chemoprophylaxis	Cephalexin, 25–50 mg/kg per day in 2–4 divided doses (maximum 1 g/d)	10

sive group A *Streptococcus* infection. The use of this more stringent definition excluded several deaths and may explain our lower than expected mortality rate.

The scope of invasive group A *Streptococcus* infection in northwestern Ontario was similar to the disease profiles encountered in the literature. Most of our cases (57%) were bacteremia without focus, which is often the most common presentation of invasive group A *Streptococcus* infection.[11,12,14,28,32,33,36] The second most common presentation was skin and soft-tissue infection (28%), including necrotizing fasciitis (9%). Streptococcal toxic shock syndrome developed in 11% of cases, which is also in keeping with established estimates of 5%–28%.[10–12,16,22,29,31,35]

Limitations

Some cases may not have been captured owing to the retrospective nature of our review. Severely ill patients may have been transferred directly from their home community to a tertiary care centre; these patients would not have been seen at the SLMHC and were therefore not included in this study. The incidence rate of invasive group A *Streptococcus* infection reported here may therefore underestimate the true burden of the disease.

We identified only 65 cases in a 6-year period, which limited possible statistical analyses. Furthermore, only limited clinical data (outcome, diagnosis, comorbidities) were available for each case of invasive group A *Streptococcus* infection, and the data did not include treatment information for each patient, as our focus was on disease incidence during data collection.

CONCLUSION

Rural physicians may occasionally encounter group A *Streptococcus* bacteremia in their practice. The death rate associated with these invasive infections is high, and patients require urgent treatment, typically with intravenous penicillin and clindamycin therapy. The rate of invasive group A *Streptococcus* infection in the predominantly First Nations population served by the SLMHC in northwestern Ontario exceeds the Canadian norm eightfold and is comparable to that of low-income countries. This disparity may result from inadequate housing, overcrowding or limited access to clean water.

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Original Article
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How underserviced rural communities approach physician recruitment: changes following the opening of a socially accountable medical school in northern Ontario

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Introduction: The Northern Ontario School of Medicine (NOSM) opened in 2005 with a social accountability mandate to address a long history of physician shortages in northern Ontario. The objective of this qualitative study was to understand the school's effect on recruitment of family physicians into medically underserviced rural communities of northern Ontario.

Methods: We conducted a multiple case study of 8 small rural communities in northern Ontario that were considered medically underserviced by the provincial ministry of health and had successfully recruited NOSM-trained physicians. We interviewed 10 people responsible for physician recruitment in these communities. Interview transcripts were analyzed by means of an inductive and iterative thematic method.

Results: All 8 communities were NOSM medical education sites with populations of 1600–16 000. Positive changes, linked to collaboration with NOSM, included achieving a full complement of physicians in 5 communities with previous chronic shortages of 30%–50% of the physician supply, substantial reduction in recruitment expenditures, decreased reliance on locums and a shift from crisis management to long-term planning in recruitment activities. The magnitude of positive changes varied across communities, with individual leadership and communities' active engagement being key factors in successful physician recruitment.

Conclusion: Locating medical education sites in underserviced rural communities in northern Ontario and engaging these communities in training rural physicians showed great potential to improve the ability of small rural communities to recruit family physicians and alleviate physician shortages in the region.

Introduction : L'École de médecine du Nord de l'Ontario (EMNO), qui a ouvert ses portes en 2005, a pour mandat social de combler la pénurie d'effectifs médicaux qui sévit depuis longtemps dans le Nord de l'Ontario. L'objectif de cette étude qualitative était d'étudier l'effet qu'a eu l'école sur le recrutement des médecins de famille dans des communautés rurales mal desservies dans cette région de la province.

Méthodes : Nous avons procédé à une étude de cas multiples auprès de 8 petites communautés rurales du Nord de l'Ontario considérées comme mal desservies par le ministère de la Santé provincial sur le plan des effectifs médicaux et ayant réussi à recruter des médecins formés à l'EMNO. Nous avons interrogé 10 personnes responsables du recrutement des médecins dans ces communautés. La transcription des entrevues a été analysée au moyen d'une méthode thématique inductive et itérative.

Résultats : La formation médicale de l'EMNO était offerte dans les 8 communautés, dont la population variait de 1600 à 16 000 habitants. Parmi les améliorations reliées à la collaboration avec l'EMNO, mentionnons : le recrutement de médecins dans 5 communautés où sévissaient auparavant des pénuries chroniques de l'ordre de 30 % à 50 %, une réduction substantielle des dépenses liées au recrutement, une diminution

du recours à des remplaçants et la transition des activités de recrutement pour passer d'une situation de gestion de crise à une situation de planification à long terme. L'ampleur des améliorations a varié selon les communautés; le leadership individuel et la participation active des communautés ont été des facteurs clés de la réussite du recrutement des médecins.

Conclusion : La prestation d'une formation dans de petites communautés rurales mal desservies du Nord de l'Ontario et la mobilisation des communautés visées à l'endroit de la formation des médecins en milieu rural ont révélé leur fort potentiel d'amélioration de la capacité de recruter des médecins de famille et de corriger les pénuries d'effectifs médicaux dans la région.

INTRODUCTION

There is a persistent shortage of physicians in northern Ontario,[1–3] a vast area of roughly 800 000 km^2 with a scattered population of about 800 000.[4] As one of several Ontario government strategies designed to improve access to health care in northern areas,[5] the Northern Ontario School of Medicine (NOSM) opened in 2005, with a social accountability mandate to be responsive to the "needs of the people and communities of the region with a focus on improving their health."[6] NOSM's commitment to social accountability starts with preadmission programs and continues with selection of students who are representative of northern Ontario with respect to rural, northern, Indigenous or francophone backgrounds. NOSM facilitates medical education, accepting 64 undergraduate and about 60 postgraduate[7] learners each year, as well as the education of other health care professionals (e.g., dietitians, physician assistants and therapists) in over 90 communities located primarily in northern Ontario.[8]

NOSM undergraduate students spend a mandatory 4 weeks in Indigenous communities at the end of their first year and two 4-week placements in small (< 5000 people) rural and remote communities during their second year. The full 8 months of the third year is spent in 1 of 15 small urban or large rural communities (5000–70 000 people). Students may also take rural electives in their fourth year. NOSM postgraduate residents spend 3–9 months per year in small cities and small or large towns, with family medicine residents in the rural stream spending the most time in these small northern Ontario communities.[8] With individual communities hosting NOSM learners for 1–9 months, the communities' active contributions to learning are a key feature of NOSM's distributed community-engaged learning model, consistent with the school's social accountability mandate.[8]

The first 3 cohorts of family physicians (n = 131), who completed undergraduate (n = 49), postgraduate (n = 31) or both (n = 51) medical education programs at NOSM, started full practice in 2011–2013. In 2014, 79 (60.3%) of these physicians had set up practice in northern Ontario, with 21 (16.0%) in rural communities.[9] Based on research that documented the potential benefits of rural medical education to physician recruitment into rural communities,[10–16] and with earlier assessment of NOSM's socioeconomic impact on rural communities,[17] it was expected that the presence of NOSM in the region would help to alleviate physician shortages in northern Ontario. In this qualitative study, we investigated NOSM's impact on physician recruitment in selected medically underserviced rural communities of northern Ontario using first-hand accounts of people responsible for physician recruitment.

METHODS

We used a multiple case study design.[18] We chose communities that 1) were rural and medically underserviced, based on the Rurality Index for Ontario used by the Ministry of Health and Long-Term Care to determine eligibility for the Underserviced Area Program,[19] and 2) had recruited NOSM graduates as family physicians.

We identified people responsible for physician recruitment in selected communities, contacted them by telephone to introduce our study and asked their permission to send out a study package, including an invitation letter signed by the NOSM's dean, a consent form and an interview guide. No participation incentives were offered. Key informants were interviewed by telephone in the fall of 2014.

The semistructured interviews contained questions about the interviewees' role in the community's physician recruitment process, past and current physician recruitment activities in the community, and the interviewees' experience of collaboration with NOSM. Interviews were conducted by a team of 2 or 3 researchers and lasted about 30 (range 20–50) minutes. In addition to answering the structured questions, participants were invited to elaborate on points that interviewers thought to be unclear or particularly relevant for the study. After each inter-

view, researchers had a brief discussion of the interview and of any questions regarding interpretation.

All interviews were recorded and transcribed verbatim by professional transcribers. The transcripts were reviewed by 2 researchers for accuracy and were uploaded to NVivo 10 for Windows (QSR International), which was used for coding transcripts and applying an inductive and iterative thematic analytic method.[20] Most of the themes were predefined by the structured interview questions. Other common themes were identified by the comparison-and-contrasting method. The cross-case data synthesis examined differences and similarities between the communities.[21] Key informants were contacted to verify their responses and to obtain permission to use quotes.

Ethics approval

Laurentian University's Research Ethics Board granted ethical approval.

RESULTS

Communities and key informants

Twelve communities in northern Ontario met our case definition at the time of the study (fall 2014): Bracebridge, Chapleau, Dryden, Elliott Lake, Espanola, Hearst, Kenora, Little Current, Marathon, New Liskeard, Nipigon and Sioux Lookout (Fig. 1). Fifteen potential interviewees were identified who were responsible for physician recruitment in the 12 communities. Of the 15, 3 did not answer the telephone or respond to our voice messages (up to 3 attempts were made), and 2 received the study invitation but did not return a consent to participate in the study. The remaining 10 people consented to participate in the study as key informants and were interviewed.

Four key informants were employed as physician recruiters; 2 of the 4 also worked as NOSM site administrative coordinators for the educational programs in their community. The other 6 key informants were senior executives or managers at local hospitals, family health teams or physician groups and were responsible for physician recruitment in their organizations. Key informants had worked in their positions for 1.5–16 years.

The key informants represented 8 communities with populations ranging from 1600 to 16 000 people, located 70–600 km from the major cities of Sudbury or Thunder Bay, and serving catchment areas with populations up to 35 000 (as estimated by key informants) (Fig. 1). Five communities were located 300 km or more from either Sudbury or Thunder Bay. One community had a predominantly francophone population, and another had a substantial proportion of Indigenous people. All communities were NOSM education sites, accommodating 3–6 undergraduate and postgraduate placements with at least 2 learners per placement.[22,23]

Changes to physician recruitment

Fewer physician shortages

According to key informants, 6 of 8 communities had experienced a shortage of family physicians in the previous 5–10 years that ranged from 30% to 50% of the required supply. At the time of the study, 5 had achieved a full or almost full complement of family doctors. In these communities, based on key informants' estimates, the need for family physicians decreased from about 30 full-time physician vacancies to only 1 full-time physician vacancy. Dependency on locum doctors was also reported to have declined. Key informants expressed relief from the chronic stress of physician shortages:

> It's nice to be out of crisis mode. (KI-1)

> So we're at a point now of almost turning people away because we're getting full. I'm not out beating the ground anymore. It's a little more relaxing right now. (KI-2)

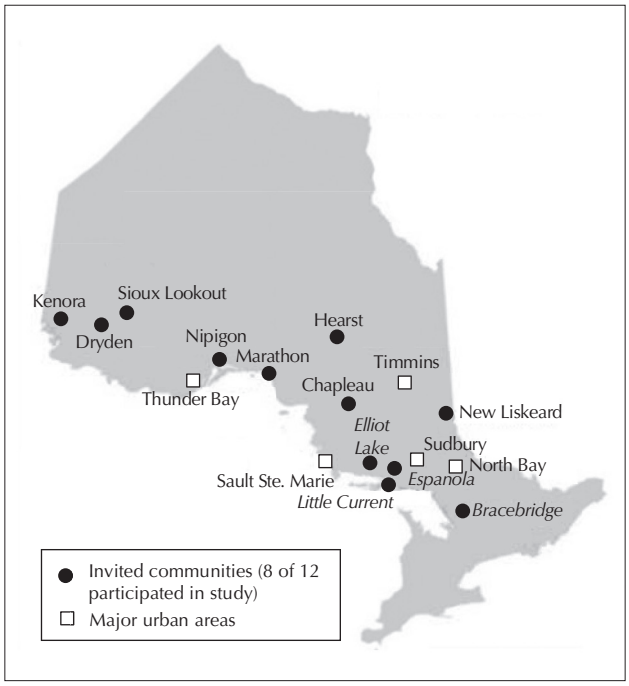

Fig. 1. Northern Ontario communities selected for invitation to the study.

One community, however, continued to struggle with the physician shortage, needing to fill about 30% of the positions and still relying heavily on locum doctors. The remaining 2 communities had not had problems with physician shortages in the past, but key informants reported that this problem could arise with future retirements of their permanent doctors.

New recruitment strategies

NOSM's presence in the communities and the region changed communities' reliance on traditional recruitment strategies (Table 1). Key informants agreed that NOSM graduates who were exposed to rural and northern communities during their undergraduate or postgraduate training were easier to recruit than physicians who trained in southern Ontario or internationally. Regardless of how physician recruitment was organized within communities, key informants recognized NOSM as a major source for new physicians. As 1 key informant noted:

> Most of our new doctors in the community are associated with NOSM. So for us, it's probably the single biggest source of current and future doctors. (KI-2)

Table 1: Changes in physician recruitment strategies in 8 communities

Previous 5–10 yr	Current
Attended conferences (e.g., Family Medicine Forum, Society of Rural Physicians, HealthForceOntario, Professional Association of Residents of Ontario)	Visiting medical schools, including NOSM
Attended job fairs/conferences (travelled "all over the place"), used financial incentives, recruited international medical graduates	Focusing on NOSM learners, involving less travel and fewer financial incentives
Attended job fairs/conferences (recruited mostly locums)	Focusing on NOSM learners
Attended job fairs/conferences	Focusing on NOSM learners, accommodating interests and practice styles of new physicians, using financial incentives
Attended job fairs/conferences	Community funding, hiring physician recruiter to work with NOSM
Recruitment done by physicians, not supported by community	Having physician recruiter paid by physicians, collaborating with NOSM
Attended HealthForceOntario recruitment tours	Investing in material infrastructure, collaborating with NOSM
Attended HealthForceOntario recruitment tours and recruitment job fairs (recruited mostly locums)	Being involved with medical schools, including NOSM

NOSM = Northern Ontario School of Medicine.

Four communities hosted NOSM's 8-month Community Comprehensive Clerkship (longitudinal integrated clerkship for the third-year students). One key informant explained how a prolonged stay of medical learners in the community facilitates recruitment:

> [NOSM] students live here for 8 months, so in the long run, after their fourth year and 2 years' residence, if they want to settle somewhere, well, they have stayed here for 8 months so they know the role, they know the activities, they know the communities, so it's a big investment in recruiting, being a Comprehensive Community Clerkship community. (KI-3)

Hiring NOSM graduates who were raised in the communities was a common practice:

> We've had a couple of local kids go through the NOSM program and come back here. We currently have 2 [Comprehensive Community Clerkships], third-year clerks who are local kids. That's really important. Half a dozen local kids are [now] in the NOSM stream. And that's part of our longer-term planning. (KI-2)

Key informants from communities that achieved a full complement of physicians noted a shift in recruitment focus. For example, 6 communities were expecting more than half of their physicians to retire in the next 3–7 years, and, thus, the need for succession planning emerged. Beyond the numbers, key informants identified a need for physicians with certain skills:

> We need to recruit more physicians [who] will, as part of their practice, go to First Nations communities. (KI-4)

> We have trouble recruiting a general surgeon. I'm honest with you that the new graduating surgeons don't fit the rural model. (KI-5)

Some informants also identified the need for physician retention but were not as far along in this regard as they would have liked.

Decreased recruitment expenditures

Annual recruitment budgets estimated by key informants ranged from $4000 to more than $200 000. These budgets paid for recruitment trips, physician incentives and, in some communities, the salary of the physician recruiter. Funding sources for recruitment activities included large-scale fundraising events, fixed portions of hospitals' and other health care organizations' budgets, and local physicians' "out-of-pocket" support.

According to key informants, trips to job fairs in larger urban areas of southern Ontario were costly

and tended to recruit locum physicians rather than permanent doctors. Travel to job fairs and associated costs decreased in communities that were successful in recruiting NOSM graduates as family physicians.

Physician incentives included return-of-service payments, housing and lifestyle inducements such as free memberships to local recreational facilities. Communities differed in their ability and approach to using physician incentives. For example, some communities' budgets were too small for return-of-service contracts; other communities, in the words of the key informants, were explicitly opposed to cash incentives and invested resources exclusively into building new or upgrading existing physician clinics. Having NOSM as a new source for physician recruitment permitted communities to decrease financial incentives offered to doctors. In the words of 1 key informant:

> We've pared that down, I guess, to reflect our decreasing desperation. And it's gone from $200 000 to $100 000 to $80 000, and we've pared it down to $50 [thousand for 4 years]. (KI-1)

Varying benefits from presence of NOSM

Physician recruitment outcomes varied across communities (Fig. 2). On one side of the continuum were the more successful communities, those that were "making strides." These communities had achieved the full complement of family physicians and were in a synergistic relation with NOSM that encompassed medical education and physician recruitment. In the words of 1 key informant:

> Initially, we did not see a lot of resident traffic here. But, certainly, we've made strides to raise the profile of our community [at NOSM]. We participate in the interview process; we provide staff that go down there for a weekend and sit in on both days of the interview for the incoming class. … And then we've got some [NOSM] faculty members who are involved with the postgrad curriculum and deliver a lot of learning and training sessions. We've appointed a designate to sit on the strategic planning committee for NOSM for 2015–2020. We proctor exams here. (KI-1)

On the other side of the continuum were the communities that continued to deal with physician shortages. NOSM's impact on these communities was not perceived as substantial:

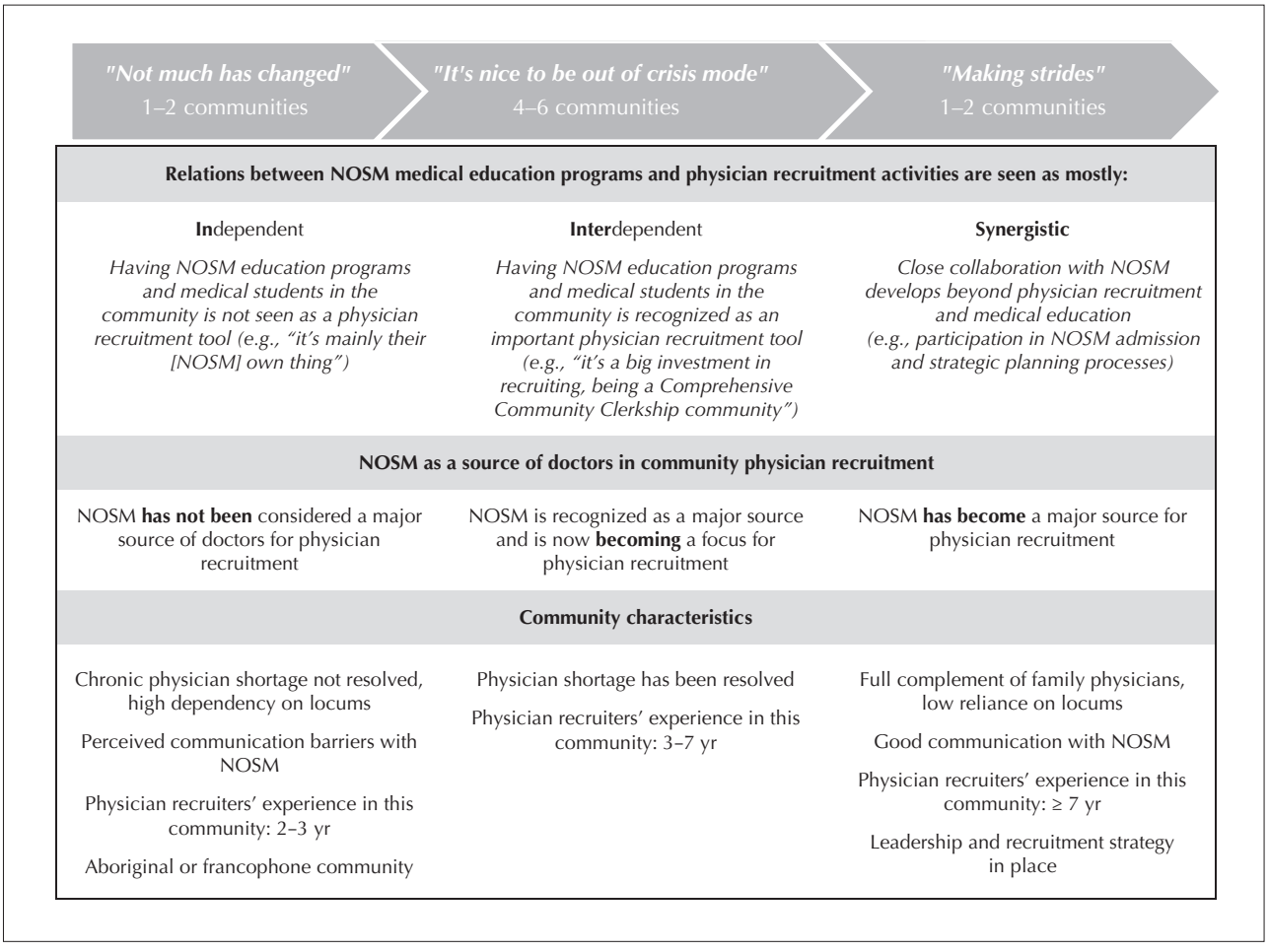

Fig. 2. Summary of key informants' perceptions of the impact of the Northern Ontario School of Medicine (NOSM) on physician recruitment in 8 rural communities that recruited NOSM graduates.

As soon as we get this recruiter hired, the main focus is going to be establishing a relationship with the Northern Ontario School of Medicine. Right now we can't say that we feel like we've benefited [from NOSM's presence in the community]. (KI-2)

Most key informants emphasized that hosting NOSM's educational programs in the communities worked well for physician recruitment in combination with other factors (Fig. 2). The whole community's support, for example, was important to overcome physician shortages but varied among communities. Another factor was the leadership of individual physician recruiters, who, in collaboration with NOSM and other community stakeholders, aligned their internal recruitment strategy with external factors. For instance, key informants talked about physician workforce practice interests or broader health care reforms:

What's changed drastically is our approach. We've changed our strategy to not force doctors or make them feel compelled that they have to work in areas that they're uncomfortable with. (KI-3)

Part of the key was a combination of things, moving from fee-for-service to blended capitation, rostering patients, family health team and the huge presence of NOSM. (KI-5)

Balancing community recruitment and medical education

Interviewees shared a common perception that NOSM sought to protect learners from undue recruitment efforts by communities. This perception was to some extent in conflict with communities' interests in seeing learners as potential recruits. Communities resolved this conflict by prioritizing medical education in the community and leaving physician recruitment to "naturally" stem from the students' experiences. Two key informants described this approach:

When we take on students and residents, we don't do it for the sole purpose of, you know, we're going to try to recruit them. I think first and foremost you have to do this because you're a teaching site and you've got to feel good and honour that you're part of that process. … So we try to make the students feel very comfortable, we don't make them feel like as if we're trying to recruit them. ... If you do all that, well, they'll take a natural liking to your community, and I think that's important. (KI-5)

We try and provide the best learning and living experiences we can for the learners. And then they, quite often, will come back for follow-up electives and rotations. And then the conversation just grows from there … it sort of happens organically from there. There are no greasy sales. I mean, they see it for … what it really is here. (KI-1)

Key informants suggested that better communication between NOSM and the community contributed to better recruitment success. Regardless of perceived adequacy of communication, most key informants noted communication with NOSM as an area for improvement. Informants mentioned the need for better liaison with the school, community visits by school representatives and communities' ability to contact medical learners.

DISCUSSION

In this study, we sought to understand how NOSM, a socially accountable school with the distributed community-engaged learning model, influences physician recruitment into underserviced rural communities of northern Ontario. As of fall 2014, 5 of the 8 communities studied had achieved a full, or almost full, complement of family physicians, which was attributed in large part to NOSM's presence in the region. Communities' increased engagement in NOSM's medical education programs was 1 of the key factors in successful recruitment, allowing for reductions in recruitment budgets, including decreased financial incentives offered to doctors. Other positive outcomes were decreased reliance on locum doctors and increased possibilities for physician workforce planning in regard to skill sets and succession.

Benefits of community-engaged medical education, particularly of longitudinal integrated clerkships, to learners and medical education outcomes are well reported in the literature.[22,24,25] Less is known about benefits of community–medical school relations for the participating communities.[26,27] Our study contributes to this knowledge. Based on the accounts of key informants with first-hand responsibility for physician recruitment to the small rural communities, NOSM is a major (and sometimes the only) source of physicians for these communities. This has implications for communities' traditional recruitment strategies,[28] which were changing from participation at conferences and job fairs to a more "natural" approach of "recruitment without recruiting" through the communities' proactive participation in medical education. Most key informants in our study mentioned the costliness and ineffectiveness of the traditional travel to job fairs for recruiting permanent physicians.

Consistent with other studies,[24,26] our study showed that communities' participation in medical programs requires significant effort and resources. All communities studied were participating in NOSM medical programs, but physician recruit-

ment outcomes and the communities' capacity to be engaged in medical education varied. Not all key informants had full community support, sufficient funds or strong leadership to fully capitalize on the presence of the medical school, as informants in the more successful communities did. This variability may be related to the diversity of problems facing small rural communities, different priorities for allocating human and financial resources, variability in "the nature of social contract" within communities and health care organizations[29] and the complexity of medical school–community relations.[24] Differences in the duration of relations between NOSM and the community, which may have been reflected in the duration and nature of the key informants' work experience, may also be a contributing factor.

The need for physicians with skills to work in Indigenous communities was voiced by key informants in our study. Indigenous peoples experience poor access to medical care[30] and have poorer health status relative to their non-Indigenous neighbours.[31] Francophone people in Ontario also have poorer health status than the general population in the province,[32] and there is a shortage of French-speaking doctors in rural communities in northern Ontario.[33] This may help explain the continuum of NOSM's impact on physician recruitment outcomes in this study: the 2 "least successful" communities were the Indigenous and francophone communities. Cultural variations may represent challenges for community engagement in medical education.[29] A recent study showed that NOSM learners had superior baseline knowledge on the historical, political and geographical issues affecting rural areas, including Indigenous communities.[34] Indigenous health curriculum,[35] mandatory community clerkship in Indigenous communities[8] and support of Indigenous and francophone applicants[36] at NOSM may contribute over the long term toward meeting the need for more physicians for Indigenous and francophone communities. In addition to potential language and cultural barriers, the 2 communities were also among the farthest from NOSM's main campuses. The combination of remoteness and cultural barriers may pose additional communication challenges and intensify problems that all underserviced rural communities face (e.g., spousal employment).[37,38] Additional research is needed to explore possible reasons for lower recruitment success in these communities.

Key informants realized the need for long-term planning of physician recruitment. They also emphasized the importance of having medical learners in their communities, including "local kids" who grew up in the area. This thinking is consistent with a "rural pipeline" approach to recruitment of physicians that involves encouraging rural youth to enter the medical profession and providing rural exposure during medical education.[39,40] NOSM supports all stages of this approach by providing rural exposure during medical training,[12] preadmission contact between rural secondary schools and the medical profession[41] and admission processes to select students with rural, northern, Indigenous and francophone backgrounds.[23] According to most interviewees, physician retention is important but was not yet a priority in their plans, as recruitment had only recently been resolved in their communities. The recent success in physician recruitment suggests the potential for a positive impact of NOSM on physician retention. However, future research is needed to assess the actual effect.

NOSM's impact extends beyond supplying rural doctors and helping small rural communities to overcome physician shortages. Key informants in the communities with a full complement of physicians expressed a strong sense of pride and empowerment from engagement in medical programs. This finding is in line with previous research.[26] At the same time, awareness of the power differential between small rural communities and medical institutions is important for the full positive impact of the socially accountable medical school on the health of the communities. Consistent with previous research,[17] communication with the medical school was challenging for some communities in our study. Our findings provide material for a positive critique and, accordingly, improvements of the relations between NOSM and the communities that are currently engaged with or are planning to become engaged with the medical school, so as to better achieve NOSM's social accountability mandate.

Strengths and limitations

Using the first-hand accounts of key informants who were responsible for physician recruitment was a strength of our study. It should be kept in mind that their views may differ from those of other community members, medical school administrators or students, and physicians and thus may not capture all factors contributing to the impact of NOSM on recruitment in northern Ontario communities. Studying 8 of the 12 community cases initially selected was a limitation. However, the data collected allowed for better understanding of NOSM's impact on physician recruitment and supported

general analytical inferences, including evidence regarding common changes in recruitment approaches and a diversity in outcomes across communities. Most likely, including the other 4 communities would not have had a substantial effect on our results, although it might have enhanced the results with different perspectives (e.g., from physicians in the role of physician recruiters). The study results may be transferrable to other communities participating in medical education with NOSM or other medical schools with a similar social accountability mandate and distributed medical education model.

CONCLUSION

Locating medical educational sites in underserviced rural communities in northern Ontario and engaging these communities in training rural physicians shows great potential to improve the ability of small rural communities to recruit family physicians and alleviate physician shortages in the region. Future studies could extend our findings about the effect of a socially accountable medical education and community-engaged learning model on physician recruitment into underserviced rural communities across Canada and around the world. Other underserviced rural communities that are NOSM educational sites and have not been successful in recruiting NOSM graduates, or communities that are not NOSM educational sites should be studied to better understand the full impact of NOSM on physician recruitment in the region. Additional Indigenous, francophone and remote communities should be studied to understand possible factors affecting lower recruitment. In addition, ongoing studies are needed to assess the impact of NOSM on skill set mix, retention and sustainability of the physician workforce in northern Ontario.

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Impact of travel distance on access to treatment and survival in patients with metastatic colorectal cancer prescribed bevacizumab plus chemotherapy

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Introduction: Given Saskatchewan's size and low population density outside of city centres, many rural and remote residents have issues accessing regional oncology services. We performed a study to determine whether travel distance to cancer treatment centres affects first-line treatment accessibility and survival in patients with metastatic colorectal adenocarcinoma.
Methods: Retrospective chart review of patients with stage IV metastatic colorectal adenocarcinoma collected by the Saskatchewan Cancer Agency registry between June 1, 2009, and June 30, 2013. Patients were categorized as living within 100 km of or more than 100 km from the nearest cancer treatment centre offering bevacizumab plus first-line chemotherapy. Main outcome measures were differences in first-line treatment accessibility and overall survival estimates (calculated via the Kaplan–Meier method) between cohorts.
Results: Of the 252 included patients, 91 (36.1%) resided more than 100 km from a cancer treatment centre. Accessibility of standard single-agent and combination chemotherapy in the first-line setting, when not prescribed in conjunction with bevacizumab, was comparable between cohorts. Patients living within 100 km of a treatment centre and those living more than 100 km from a treatment centre had comparable access to bevacizumab in conjunction with first-line chemotherapy (57 [62.6%] v. 116 [72.0%] patients; $p = 0.1$) and similar median overall survival (18.1 v. 25.0 mo; $p = 0.2$).
Conclusion: Neither access to bevacizumab treatment nor survival times for metastatic colorectal adenocarcinoma were significantly different between the cohorts. This suggests that health care providers in Saskatchewan may be doing well in arranging timely access to advanced oncology centres. Future studies with a larger sample, different tumour types or changes to the definition of remoteness are indicated.

Introduction : Compte tenu de la taille de la Saskatchewan et de la faible densité de sa population hors des centres urbains, beaucoup de personnes en régions rurales et éloignées ont de la difficulté à obtenir des services d'oncologie régionaux. Nous avons mené une étude pour déterminer si la distance à parcourir pour se rendre aux centres de traitement du cancer a des répercussions sur l'accès aux traitements de première intention et sur la survie des patients atteints d'adénocarcinome colorectal métastasique.
Méthodes : Nous avons procédé à un examen rétrospectif des dossiers du registre de la Saskatchewan Cancer Agency portant sur les patients atteints d'adénocarcinome colorectal métastasique de stade IV, pour la période du 1er juin 2009 au 30 juin 2013. Nous avons réparti les patients selon 2 catégories : ceux vivant à moins de 100 km et ceux vivant à plus de 100 km du centre de traitement du cancer le plus près offrant le bévacizumab et la chimiothérapie de première intention. Nous avons utilisé comme principaux indicateurs de résultats les différences entre les cohortes au niveau de l'accès au traitement de première intention et du taux de survie global estimé (calculés d'après la méthode Kaplan–Meier).
Résultats : Sur les 252 patients de l'étude, 91 (36,1 %) habitaient à plus de 100 km d'un

centre de traitement du cancer. L'accès à une monothérapie standard et à une chimiothérapie combinée en première intention, lorsque non prescrite en même temps que le bévacizumab, était comparable entre les cohortes. Les patients vivant à moins de 100 km d'un centre de traitement et ceux vivant à plus de 100 km d'un centre de traitement avaient un accès comparable au bévacizumab associé à la chimiothérapie de première intention (57 [62,6 %] c. 116 [72,0 %] patients; p = 0,1) et un taux de survie global médian similaire (18,1 c. 25,0 mois; p = 0,2).
Conclusion : Il n'y avait aucune différence sur le plan statistique entre les cohortes pour ce qui est de l'accès au traitement de bévacizumab et de la durée de survie pour l'adénocarcinome colorectal métastasique. Ces résultats suggèrent que les professionnels de la santé de la Saskatchewan réussissent bien à prévoir l'accès rapide aux centres de traitement avancé en oncologie. D'autres études sont nécessaires au moyen d'un échantillon plus important, sur d'autres types de tumeurs ou en modifiant la définition de l'éloignement.

INTRODUCTION

Colorectal cancer is the third most common cancer in Canada.[1] In 2015, there were estimated to be 770 newly diagnosed cases and 280 deaths due to colorectal cancer in Saskatchewan.[1] Of these patients, about 15%–20% had metastatic disease on initial diagnosis.[2]

Treatment for metastatic colorectal adenocarcinoma, which is the most common histological subtype of colorectal cancer, has evolved over the past 2 decades.[3,4] The standard first-line regimens initially consisted of various arrangements of 5 chemotherapeutic agents: irinotecan, fluorouracil, folinic acid, oxaliplatin and capecitabine.[4,5] Studies evaluating these regimens showed that the median overall survival of patients ranged from about 13.4 to 16.8 months.[6–8] Bevacizumab, a humanized monoclonal antibody targeting vascular endothelial growth factor in tumours, was approved for use in Saskatchewan as of January 2008.[4,9] According to phase III clinical trials, bevacizumab, in conjunction with combination chemotherapy, can improve median overall survival by up to 5.3 months compared to combination chemotherapy alone.[7,8,10] The challenge now is ensuring that bevacizumab plus chemotherapy is accessible to all patients with metastatic colorectal cancer living in the province.

Owing to Saskatchewan's extensive land mass and low population density outside of city centres, many rural, remote and northern residents have issues accessing regional oncology services.[11,12] Reports indicate that two-thirds of remote and northern Canadian residents live farther than 100 km away from a physician. This contributes to the poorer health status and reduced life expectancy of these populations.[13] In addition, health in these communities is affected by other modifiable and nonmodifiable conditions such as age, sex, genetics, ethnicity, socioeconomic status, level of education, types of coping behaviour, physical environment, employment opportunities and working conditions.[12,13] Despite these factors, an Australian study showed that increasing distance from place of residence to radiotherapy treatment facilities was independently associated with lower survival in patients with rectal cancer.[14] This finding may be partially attributable to the increased financial burdens, stress and time away from social supports that are often incurred by patients travelling long distances for treatment.[13]

To mitigate these distance-related determinants of health, the Saskatchewan Cancer Agency developed the Community Oncology Program of Saskatchewan in collaboration with 10 of the province's 13 health regions.[15] The program, which is coordinated by the 2 provincial tertiary cancer centres, in Regina and Saskatoon, operates in 16 rural and remote hospital-based community oncology centres.[15] At the time of the study, however, only 2 of the 16 community oncology centres had the necessary resources to provide patients with bevacizumab in conjunction with chemotherapy. This is predicted to be a major barrier to access as patients being treated with this regimen require in-hospital, supervised intravenous infusion of bevacizumab once every 2 weeks.

In this study, we used the Saskatchewan Cancer Agency registry to determine whether patients with metastatic colorectal adenocarcinoma living within 100 km of a cancer treatment centre access first-line chemotherapy plus bevacizumab more often, or have higher survival rates, than patients living farther than 100 km from any of the 4 cancer treatment centres in the province offering this therapy.

METHODS

Patients

Included patients had histologically confirmed stage IV metastatic colorectal adenocarcinoma on initial diagnosis. Other selection criteria included being a Saskatchewan resident, having a colorectal primary tumour and having received a diagnosis of metastatic

disease between June 1, 2009, and June 30, 2013. Patients were excluded if they did not receive chemotherapy in the first-line setting, received single-agent fluoropyrimidine-based chemotherapy without bevacizumab or were involved in any clinical trials.

Study design

In this observational retrospective chart review, we evaluated patients who received care from at least 1 of the 4 following Saskatchewan cancer treatment centres: 1) Allan Blair Cancer Centre, Regina, 2) Saskatoon Cancer Centre, Saskatoon, 3) Battlefords Union Hospital, North Battleford, and 4) St. Peter's Hospital, Melville.

We identified patients who met the inclusion criteria using the Saskatchewan Cancer Agency registry and pharmacy database. We obtained the electronic medical records and paper charts of these patients and devised an Excel data sheet to record manually extracted data such as first-line treatment type, whether bevacizumab was provided in a second-line setting, month/year of diagnosis of metastatic colorectal adenocarcinoma, month/year of last follow-up and month/year of death (if applicable). We categorized patients into 1 of 2 groups based on distance from the nearest of the 4 cancer treatment centres offering bevacizumab plus first-line chemotherapy: 100 km or less, or more than 100 km. We used the first 3 digits of the patient's postal code and the address of each of the cancer treatment centres to approximate the distance in kilometres. We took into account that Battlefords Union Hospital and St. Peter's Hospital started providing bevacizumab with chemotherapy for metastatic colorectal cancer in February 2011.

Statistical analysis

All analyses were completed with the use of SAS software version 9.3 (SAS Institute Inc.). We used the χ^2 test to evaluate accessibility data and the Kaplan–Meier method to complete overall survival analysis. Patient's date of death was considered an event, and the study cut-off date was May 31, 2016. We calculated overall survival from the date of diagnosis of metastatic colorectal adenocarcinoma to the date of death (or of last follow-up if the patient was alive). The log-rank test at the p value of 0.05 was considered for the comparison of equality. Since we did not have the recurrence date in the data, we used overall survival as the outcome.

Ethics approval

Approval for this study was granted by the University of Saskatchewan Biomedical Research Ethics Board.

RESULTS

Patient characteristics

A total of 306 patients met the inclusion criteria. Of the 306, 54 were excluded based on the study exclusion criteria. Thus, 252 patients with histologically confirmed metastatic colorectal adenocarcinoma who received first-line chemotherapy were included in the study. Of the 252, 161 (63.9%) were categorized as living within 100 km of 1 of the 4 cancer treatment centres, and 91 (36.1%) as living more than 100 km from a treatment centre (Fig. 1).

Accessibility

Of the 161 patients who lived within 100 km of a cancer treatment centre, 116 (72.0%) received bevacizumab plus chemotherapy as a first-line treatment (Table 1). The corresponding figure for the 91 patients who resided more than 100 km from a cancer treatment centre was 57 (62.6%), an absolute difference of 9.4 percentage points; this difference did

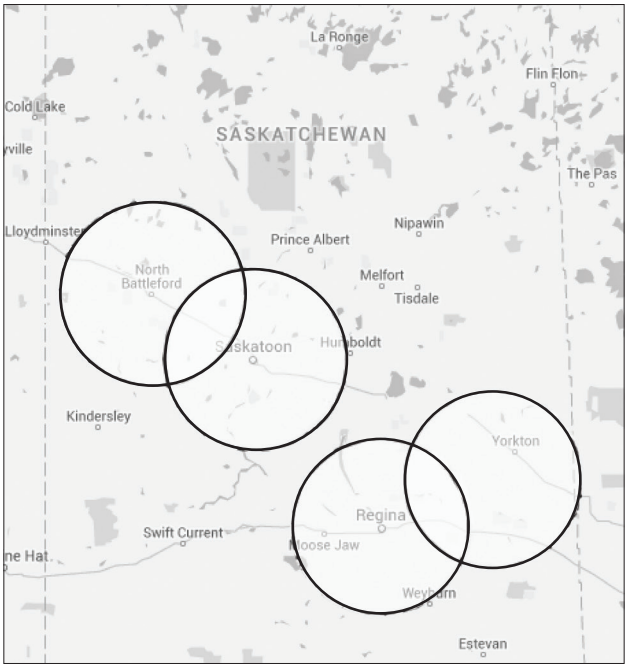

Fig. 1. Map of Saskatchewan. Four cancer treatment centres providing bevacizumab in combination with chemotherapy are indicated by circles with radius = 100 km. Left to right: Battlefords Union Hospital, North Battleford; Saskatoon Cancer Centre, Saskatoon; Allan Blair Cancer Centre, Regina; St. Peter's Hospital, Melville.

Table 1: Frequency of first-line regimens by distance to cancer treatment centre

Regimen	Distance; no. (%) of patients	
	≤ 100 km *n* = 161	> 100 km *n* = 91
CAPIRI + bevacizumab	1 (0.6)	0 (0)
CapOx*	2 (1.2)	1 (1.1)
CapOx + bevacizumab	0 (0)	2 (2.2)
FOLFIRI*	19 (11.8)	14 (15.4)
FOLFIRI + bevacizumab	94 (58.4)	48 (52.7)
FOLFOX*	19 (11.8)	15 (16.5)
FOLFOX + bevacizumab	19 (11.8)	7 (7.7)
Capecitabine*	5 (3.1)	4 (4.4)
Capecitabine + bevacizumab	2 (1.2)	0 (0)

CAPIRI = capecitabine–irinotecan, CapOx = capecitabine–oxaliplatin, FOLFIRI = folinic acid–5-FU–irinotecan, FOLFOX = folinic acid–5-FU–oxaliplatin.
*Bevacizumab administered in second-line setting.

not reach statistical significance (χ^2 = 2.39; p = 0.1). The proportions of patients in the 2 cohorts who received single-agent (capecitabine) and combination chemotherapy in the first-line setting were comparable (Table 1).

Overall survival

The median overall survival for patients who lived within 100 km of a cancer treatment centre was 25.0 months, compared to 18.1 months for those who lived more than 100 km away, a nonsignificant difference (p = 0.2) (Fig. 2).

DISCUSSION

Our results suggest that Saskatchewan patients with metastatic colorectal adenocarcinoma living more than 100 km from a cancer treatment centre offering first-line chemotherapy in conjunction with bevacizumab have comparable access to this treatment and similar median overall survival compared to patients who live within 100 km of one of these centres.

In a 2014 Australian study, the differences between rural and urban patients with metastatic colorectal cancer were also nonsignificant: 14% of rural patients and 20% of urban patients had access to first-line bevacizumab treatment, and the median overall survival was 22.0 months and 21.5 months, respectively.[16] This similarity between studies exists despite variations in regional demographic characteristics, population density and delivery of health care between the 2 countries.

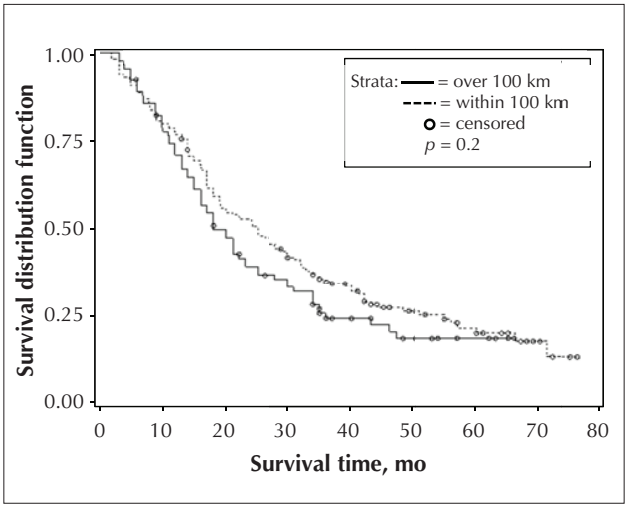

Fig. 2. Kaplan–Meier product limit overall survival estimates for patients with metastatic colorectal adenocarcinoma.

In our study, there was comparable access to standard single-agent and combination chemotherapy between the 2 cohorts. Although the median overall survival estimates and accessibility of bevacizumab plus chemotherapy as a first-line therapy were lower for the more distant cohort, the differences did not reach statistical significance. These findings suggest that oncologists, rural physicians, nurses, social workers and other health care providers may be doing well in arranging timely access to advanced oncology centres.

Strengths and limitations

Strengths of our study include the use of provincial population-level cancer registry data and estimates of travel distance based on geographic information systems and calculated from patients' partial postal codes. Limitations of the study are related to its retrospective nature, which imparts selection biases. Our failure to observe significant differences between the 2 groups may have been related to relatively small numbers, and larger studies are indicated. It is also possible that these estimates were associated with other, currently unmeasured factors. Future research using multivariate analysis examining provincial population demographic features and characteristics of patients' area of residence, which may be barriers to accessibility affecting overall survival, is necessary. Results presented in a manner that quantify the location and degree of remoteness would clarify whether a specific travel distance presents a barrier and whether any health regions require more attention and resources.

CONCLUSION

Our findings suggest that both access to bevacizumab treatment and survival times for patients with metastatic colorectal adenocarcinoma are not significantly different between those living closer to cancer treatment centres and those living farther away. This suggests that health care providers may be doing well in ensuring timely access to advanced oncology centres. Further studies with a larger sample, different tumour types or changes in the degree of remoteness are necessary.

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The occasional cardiac tamponade

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INTRODUCTION

A 67-year-old man with generalized weakness and dyspnea is brought to your rural emergency department by paramedics. A neighbour found him lying at the bottom of the stairs in front of his home. The patient is confused and unable to provide details about what occurred. No past medical history is known. On examination, the man's blood pressure is 85/57 mm Hg, heart rate 121 beats/min, respiratory rate 34 breaths/min, oxygen saturation 92% on a nonrebreather mask and temperature 37.2°C. His Glasgow Coma Scale Score is 13 (eyes 4, verbal 4, motor 5). He appears diaphoretic, indraws as he breathes rapidly and exhibits peripheral cyanosis, with cool extremities. Heart sounds are muffled, his chest is clear, and abdominal examination is normal. You are unable to appreciate any jugular venous distension. His electrocardiogram reveals sinus tachycardia with normal-sized QRS complexes and nonspecific T-wave inversion in V5–V6.

CARDIAC TAMPONADE

Undifferentiated shock is a common presentation to the rural emergency department, and cardiac tamponade needs to be considered in the differential diagnosis. Cardiac tamponade is a clinical diagnosis describing a cardiogenic shock state that occurs when accumulation of fluid in the pericardial space (pericardial effusion) results in hypotension and systemic hypoperfusion from decreased cardiac output. It is a life-threatening condition requiring immediate intervention.[1]

Point-of-care ultrasonography

For a patient in undifferentiated shock, point-of-care ultrasonography (PoCUS) during the initial assessment is rapidly becoming the standard of care in emergency departments. As part of the extended focused assessment with sonography for trauma (eFAST), cardiac PoCUS is useful for answering focused questions such as whether pericardial effusion is present.

In fact, cardiac PoCUS is the primary imaging modality for detecting pericardial effusion and definitively diagnosing cardiac tamponade. It is preferred because of its portability, lack of ionizing radiation, noninvasiveness, rapid image acquisition and interpretation, and dynamic evaluation. Furthermore, ultrasonography has been shown to better correlate to the volume of fluid drained at pericardiocentesis than computed tomography.[2] Ultrasonography is able to detect fluid collections as little as 20 mL and can show findings consistent with impending tamponade before the development of clinical signs and hemodynamic compromise.[3] Cardiac PoCUS performed by emergency physicians has a sensitivity of 96%, specificity of 98%, and overall accuracy of 97.5% for detecting pericardial effusion.[4]

Equipment

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

Procedure

Ideally, 2 or more cardiac views are suggested for assessment of pericardial effusion, as the use of only 1 view may miss a smaller effusion that is dependent or loculated. However, we present the technique for obtaining the subxiphoid view (also known as the subcostal view). This is the view generally regarded to be easier for beginners to gain competence with, and it facilitates the subxiphoid pericardiocentesis approach that was traditionally taught to be done without imaging assistance.

- With the depth of the ultrasound machine set to maximum, begin by placing the probe at the level of the umbilicus and slide it toward the xiphoid process with the probe aiming slightly toward the patient's left shoulder and the probe marker pointing toward the patient's right side (Fig. 2).
- Gradually rotate the probe toward the patient's chin until the heart comes into view on the ultrasound screen. Hold the probe with your hand on top, to facilitate flattening of the probe, often required to obtain a good image of the heart.
- The heart should be visible at the top of the screen (near field) as a beating entity.
- If the heart is not immediately visible, sweep the probe anterior–posterior (tilt the probe slowly until it is almost flat on the patient's abdomen). One can also reposition the probe, with the probe head pointing toward the neck rather than the shoulder, and repeat the anterior–posterior sweep.
- If the heart is still not visible, and the patient is able to cooperate, ask the patient to breathe in slowly. This will drop the diaphragm and the heart so that they are brought closer to the probe.
- When the entire heart is visualized, minimize the depth to enlarge the image.
- From near field to far field (top of screen to bottom of screen), the structures appear in this order: liver, pericardium, right ventricle, left ventricle and pericardium (Fig. 3).
- To complete the scan, slowly sweep the probe completely through the heart, passing from anterior to posterior and back again, ensuring that the heart disappears completely from the screen at each extreme.
- The pericardium generally appears as a bright, thick white line around the heart. This can be more easily seen by increasing the gain on the ultrasound machine.

Pericardial effusion

Pericardial fluid appears as an anechoic (black) space between the 2 pericardial layers. A small effusion (< 100 mL) is defined as less than 10 mm in thickness, moderate (100–500 mL) is 10–15 mm thick, and large (> 500 mL) is greater than 15 mm thick.[5]

- Make several measurements and document their location.

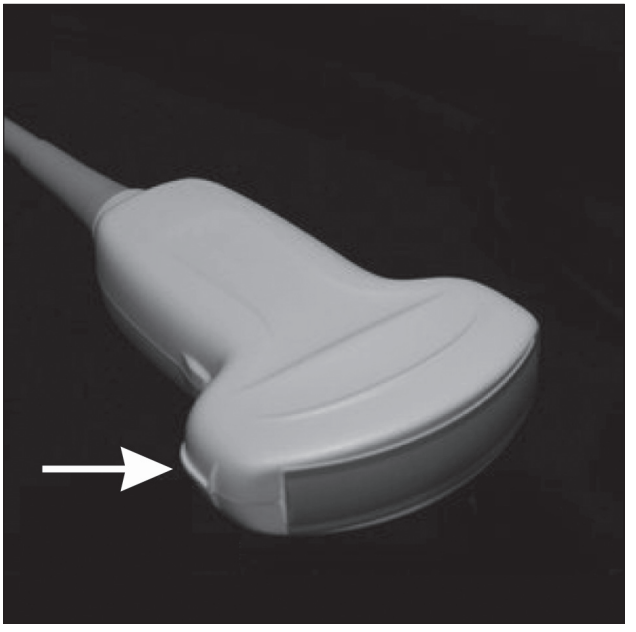

Fig. 1. Low-frequency (2–5 MHz) curvilinear probe. The probe marker (arrow) should always be pointed toward the patient's right side.

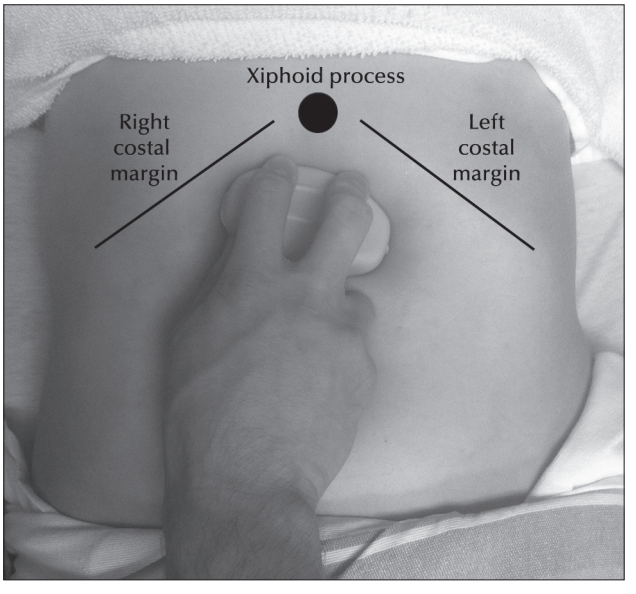

Fig. 2. Correct probe placement to obtain a subxiphoid view of the heart. Starting from the umbilicus, the probe is slid up toward the xiphoid process, which allows for the liver to be used as an acoustic window.

- In the presence of suspected cardiac tamponade, the most important thing to look for is the pericardial effusion (Fig. 4). However, cardiac PoCUS generally also shows right ventricular collapse during early diastole, right atrial collapse during late diastole and the inferior vena cava to be dilated. Patients with pulmonary hypertension and right ventricular hypertrophy may not have right heart collapse until later in the course of tamponade.[6]
- With a large circumferential effusion, the classic pattern of "swinging heart" will be seen, reflecting the heart floating in the pericardium.

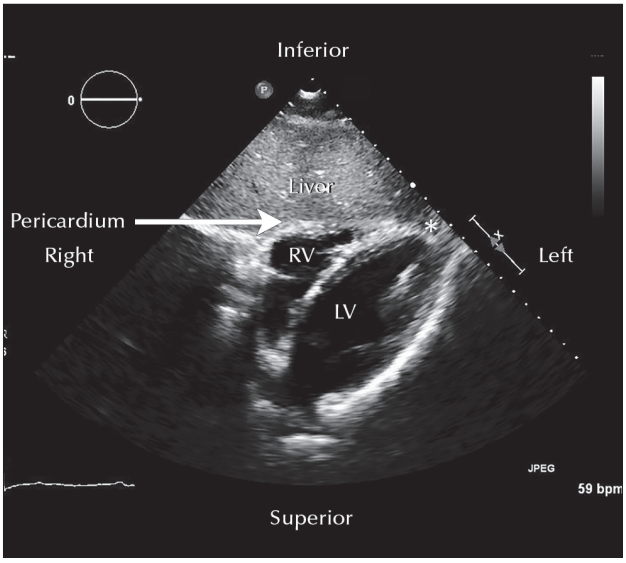

Fig. 3. Normal subxiphoid view of the heart. The right ventricle (RV) is the most inferior part of the heart and is separated from the left ventricle (LV) by the septum. For an optimal image, the operator must be able to visualize the right side of the inferior pericardium (arrow) all the way until it meets with the septum at the apex (*). The liver provides the acoustic window. P = probe marker.

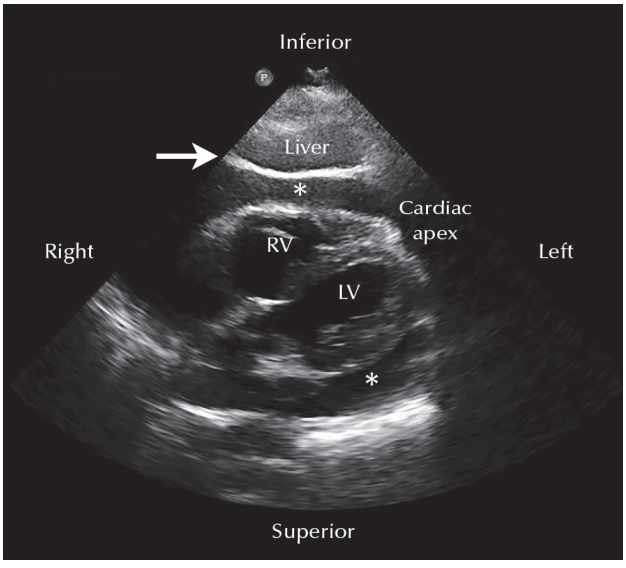

Fig. 4. Subxiphoid view of the heart with pericardial effusion (*). The effusion is identified by the black anechoic fluid surrounding the heart that separates the parietal pericardium (arrow) from the visceral pericardium. LV = left ventricle, P = probe marker, RV = right ventricle.

Additional tips

If abdominal free fluid is present, it may be found around the liver, but it will not conform to the heart border as pericardial effusion will. Pericardial effusions are always within the pericardium!

Commonly, an inexperienced sonographer may encounter a source of false-positive results — the epicardial fat pad. The fat pad is generally less black than fluid and will almost always appear only anteriorly. Note that gravity will make nonloculated effusions appear posteriorly first. This underscores the importance of scanning through the entire heart. If a hypoechoic area is seen only anteriorly while the patient is supine, it is most likely an epicardial fat pad, not pericardial effusion.[7]

In obese patients, a better view may be obtained by asking the patient to flex his or her legs, which relaxes the abdominal muscles to better facilitate image generation.

Management

Pericardiocentesis is the definitive treatment for cardiac tamponade. In rural areas without access to cardiac surgery, cardiac tamponade secondary to free wall rupture or aortic dissection is essentially a fatal condition. Extended drainage with a catheter leads to lower recurrence rates and need for surgery, as reaccumulation of fluid often occurs within 48 hours. This is safe even for children younger than 2 years of age.[6]

Cardiac PoCUS can guide pericardiocentesis more safely than the traditional blind technique. In fact, it can guide the choice of an entry point, with the shortest path to the pericardial fluid without interposed lung (usually anterior chest wall).

- In the traditional subxiphoid approach, the needle needs to traverse the liver and diaphragm. Insert the needle subxiphoid at an angle of 45° to the skin and directed at the left scapula.
- Using sterile precautions, use ultrasonography to dynamically guide needle advancement to avoid ventricular puncture.[8]
- Advance the needle until fluid is aspirated.
- A pigtail catheter should be inserted for

drainage. If that is unavailable, a 7 French central venous catheter can be used.

- In case of perforation of a cardiac chamber during pericardiocentesis, secure the perforating catheter in place and try another percutaneous puncture for drainage.[9]

Pericardiocentesis success rates are greater than 95%. In cases of purulent pericarditis, pericardiocentesis alone may be inadequate. Potential major complications include chamber puncture, vessel injury, pneumothorax, infection, arrhythmia, vasovagal response and pneumopericardium.[6]

Volume resuscitation and catecholamines can be temporizing treatments while awaiting pericardiocentesis. Both are controversial.[10]

In normovolemia or hypervolemia, fluid administration may cause further fluid overload and worsening of the tamponade. In dehydration/hypovolemia, intravascular fluid infusion of 250–500 mL of normal saline can maximize hemodynamic effects, but volumes higher than this have been shown to be deleterious.[10]

If using catecholamines, isoproterenol has been used as a sympathomimetic to increase heart rate and cardiac output while decreasing right atrial pressure and systemic vascular resistance. However, adrenergic stimulation may worsen tachycardia, ventricular relaxation impairment and ventricular filling.[10]

If using vasopressors, dobutamine has theoretical compensatory mechanisms to cardiac tamponade, but endogenous inotropic stimulation of the heart is often already maximized in tamponade, and further pressors may not be helpful.[11]

CASE CONTINUED

After the initial resuscitation of the patient, cardiac PoCUS is applied. The subxiphoid view of the heart identifies a large pericardial effusion, with a rapidly beating heart. A pigtail catheter is inserted under sterile precautions with ultrasound guidance into the pericardium, and 300 mL of serous fluid is drained. The patient's vital signs subsequently return to normal, with immediate resolution of his symptoms. Now, a more thorough history is taken, and further investigations are obtained for diagnosis and treatment of the underlying cause of the pericardial effusion.

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CASE REPORT
OBSERVATION DE CAS

Necrotizing pancreatitis resulting in abdominal compartment syndrome: a case report from a remote northern hospital and literature review

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INTRODUCTION

Most primary care providers and family medicine residents are aware of acute pancreatitis and a general medical approach. Less commonly seen, however, is its progression to necrotizing pancreatitis, which can further develop into abdominal compartment syndrome (ACS). Abdominal compartment syndrome carries a 50% risk of death.[1]

We describe the case of a middle-aged woman who presented to a remote northern hospital emergency department. She was admitted for presumed acute pancreatitis, but her condition continued to deteriorate, resulting in a clinical diagnosis of necrotizing pancreatitis with ACS. The case highlights the unique challenges of remote medicine, especially the lack of timely access to laboratory investigations, computed tomography (CT) and transportation to definitive care.

We conducted a PubMed and MEDLINE search of the English-language literature spanning 2011–2016 using the MeSH terms "pancreatitis," "ACS" and "intraabdominal hypertension." Based on titles and abstracts, 7 relevant research publications[1–7] were retained and reviewed for this case report.

CASE

A 39-year-old woman presented to the emergency department at the Weeneebayko General Hospital in Moose Factory, Ontario, with abdominal pain. She had a history of renal carcinoma with partial nephrectomy, fatty liver and diet-controlled diabetes mellitus. She described sudden-onset epigastric discomfort that started on waking, with multiple episodes of vomiting. She denied any bowel or bladder symptoms, and her last bowel movement was earlier that morning. She reported having had 3 sips of vodka cooler the night before; she reported rarely using alcohol otherwise. She denied any other substance use. She took no medications regularly. She denied any history of previous pancreatitis, elevated lipid levels or gallstones. She was in a monogamous sexual relationship. Review of systems gave negative results. Her vital signs were stable, and she was afebrile. The patient had diffuse abdominal discomfort on deep palpation of the abdomen, but there were no peritoneal signs.

Laboratory investigations revealed a leukocyte count of 15.8 × 10^9/L, hemoglobin concentration of 158 g/L and platelet count of 403 × 10^9/L. Electrolyte values were within normal limits, and the creatinine level was 36 μmol/L, with a normal estimated glomerular filtration rate. Liver function tests gave normal results aside from the γ-glutamyl transferase level, which was 82 U/L, double the upper limit of normal. The amylase level was elevated (279 U/L [normally 30–110 U/L]). Testing for serum

β-human chorionic gonadotropin and urinalysis gave negative results. Determination of lipase, bilirubin and hemoglobin A_{1c} levels and a lipid profile were ordered, but the results were not available before admission. A Ranson criteria score was not calculated at this time. The patient was admitted with a diagnosis of acute pancreatitis. She was not permitted to eat or drink, and intravenous therapy was started with crystalloid, morphine and dimenhydrinate.

The first morning of the hospital stay, the patient was tachycardic (120–130 beats/min) and febrile (maximum temperature 38.4°C). She was in significant distress from abdominal discomfort and bloating. She had peritoneal signs, including rebound tenderness, guarding, new distension and decreased bowel sounds. It was felt that her symptoms were not in keeping with "typical" pancreatitis. The only imaging available on site was radiography, and 3-view abdominal x-ray films were unremarkable. The locum general surgeon felt this was in keeping with acute pancreatitis and recommended CT of the abdomen.

Urgent medical evacuation was ordered for abdominal CT at the nearest hospital, which was 300 km away. This required helicopter and airplane flights with a nurse. Given the patient's presentation, intravenous antibiotic therapy was added for a potential intraabdominal abscess. That evening, the preliminary CT report included findings of "acute severe hepatitis," ascites and bowel angioedema. The pancreas showed "homogeneous enhancement, and there was no pancreatic or biliary duct dilatation."

Given that the patient did not require intensive care unit (ICU) admission at this time and was still considered a hospitalist patient from Moose Factory, previously accepted transfer protocol dictated that she be sent back to the inpatient unit overseen by family physician hospitalists in Moose Factory. Patients with acute pancreatitis, hepatitis or similar acute conditions requiring admission are returned to the unit owing to a high volume of patients, and a lack of beds and accepting physicians at the referral facility. Because of inclement weather, the patient was held over at a remote nursing station on the way back.

The second morning of the hospital stay, the patient had progressive abdominal distension that made her look 5 months' pregnant. She had ongoing pain, tachycardia and fever. Laboratory results remained normal except for an elevated lactate dehydrogenase level (1800 U/L [normally < 618 U/L]). She had no risk factors for hepatitis. Antibiotic treatment was stopped as there was no infectious etiology. Specimens for serologic testing for hepatitis were sent to a larger centre for processing. The patient's oxygen saturation level was 92% on room air, which improved to 95% on 2 L. Chest radiography showed bilateral opacification indicative of pneumonia, and therapy was started with ceftriaxone and azithromycin. Paracentesis was attempted, but bedside ultrasound examination showed a maximum fluid pocket of only 2 cm^2, with distended, edematous bowel. This did not support a diagnosis of ascites, and the patient's presentation did not fit with hepatitis, as reported on CT. She was accepted by Internal Medicine at a tertiary centre, but no beds were available. As the situation was critical, the provincial emergency referral service was contacted. An ICU physician from the same tertiary centre felt that the patient was too stable for the ICU and that we should continue to wait for the Internal Medicine bed. A nasogastric tube was inserted on the physician's recommendation.

The third morning of the hospital stay, the patient's condition worsened. She had ongoing tachycardia, fever and severe abdominal pain. Her distended abdomen now made her appear 9 months' pregnant. There was new anasarca and a slowly expanding flank hematoma (Grey Turner sign), suggestive of retroperitoneal bleeding. Her hemoglobin concentration was now 104 g/L. The Internal Medicine bed became available, but transportation was not available for the next 12 hours. The provincial emergency referral service was again contacted, and an ICU bed was found at another hospital. Transport arrived a few hours later. The admission laboratory results became available and showed a triglyceride level of 34.2 mmol/L (normally < 2.2 mmol/L) and a hemoglobin A_{1c} level of 9.2%. A diagnosis of necrotizing pancreatitis with ACS was made based on worsening symptoms, fever, tachycardia, respiratory distress and progressive anemia due to retroperitoneal bleeding.

Once at the tertiary centre, the patient had repeat abdominal CT, which showed pancreatitis with peritoneal and retroperitoneal fluid and bowel inflammatory changes. Review of the initial CT scan showed early signs of pancreatic necrosis and surrounding inflammation. She was treated with intravenous insulin therapy, oral fenofibrate therapy, ongoing intravenous administration of fluids and antibiotics for pneumonia. Her condition stabilized,

and she was repatriated back to our centre 8 days later. Serologic testing for hepatitis gave negative results.

DISCUSSION

Acute pancreatitis is the most common gastrointestinal complaint resulting in hospital admission.[1] The classic symptom of pancreatitis is acute epigastric pain radiating to the back with associated nausea and vomiting. There is often low-grade fever, tachycardia and hypotension. The abdomen is tender but usually less than expected for the subjective level of pain.[8] This fits with the initial presentation of our patient. Most patients recover within 3–4 days, but there can be serious complications.[1]

The Ranson criteria are used to predict death in patients with acute pancreatitis.[2] The first set of criteria applies to the patient on admission (leukocyte count > 16 × 10^9/L, age > 55 yr, glucose level > 10 mmol/L, aspartate aminotransferase level > 250 U/L and lactate dehydrogenase level > 350 IU/L). The second set of criteria is applied 48 hours after admission (decrease in hematocrit > 10%, increase in blood urea nitrogen level > 1.79 mmol/L, calcium level < 2 mmol/L, arterial partial pressure of oxygen < 60 mm Hg, base deficit > 4 mEq/L and requiring more than 6 L of fluid since admission). A score of 0–2 indicates a mortality rate of 2%, 3–4 a rate of 15%, 5–6 a rate of 40%, and 7–8 a rate of 100%. Our patient's score on admission is calculated to be 1 solely because of an elevated lactate dehydrogenase level on presentation. At 48 hours, the score was 2 (because of an elevated lactate dehydrogenase level and decrease in hematocrit of > 10% from admission), although some laboratory investigations needed to satisfy the criteria (e.g., arterial partial pressure of oxygen and blood urea nitrogen level) were not ordered, so the score is incomplete.

Intraabdominal hypertension may develop in up to 60% of patients with severe acute pancreatitis and may worsen to ACS in 27%.[3] Intraabdominal hypertension is defined as pathologic elevation in intraabdominal pressure of greater than 12 mm Hg.[4] Abdominal compartment syndrome is present when there is new organ dysfunction with intraabdominal pressure greater than 20 mm Hg.[4] Primary ACS is caused by intraabdominal disease, as in the current case of pancreatitis. Secondary ACS includes etiologies such as burns and postoperative complications.[5]

The cardiovascular, respiratory and renal systems are most commonly affected by ACS. From a cardiovascular perspective, increased intraabdominal pressure impairs venous return to the heart and increases left ventricular afterload. Overall, this reduces cardiac output and lowers organ perfusion pressure. This can predispose the pancreas to necrosis, which was seen in the current case of severe acute pancreatitis. In addition, high intraabdominal pressure elevates the diaphragm, reducing functional residual capacity and thoracic wall compliance. This functional restriction to ventilation can cause bibasilar atelectasis and pneumonia, as was seen on the chest x-ray films in our case. Renal compromise presents as oliguria. Elevated intraabdominal pressure decreases arterial perfusion and venous outflow from the kidneys. The renin–angiotensin system is activated, which causes fluid retention that may worsen the edema. When ACS occurs in patients with severe acute pancreatitis, the gastrointestinal system is often severely affected. High intraabdominal pressure compresses arterial perfusion and portal flow, which results in bowel edema and paralytic ileus,[5] both of which our patient had on physical examination and CT.

In pancreatitis, intraabdominal pressure starts to rise owing to severe inflammation beginning in the retroperitoneal and peripancreatic spaces. Surrounding tissue becomes edematous, and ascites begin to form. Abdominal wall edema reduces compliance, which further increases intraabdominal pressure. Retroperitoneal hemorrhage, which was suspected in our case given the presence of the Grey Turner sign, can further increase intraabdominal pressure.

The mainstay of management of severe acute pancreatitis is fluid resuscitation, which has been reported to be an independent contributor to the development of ACS.[6] Although analgesia, anxiolytics and gastrointestinal decompression are not fully endorsed by the World Society of Abdominal Compartment Syndrome (WSACS), some studies have shown these treatments to be helpful.[3–5]

To diagnose ACS, clinicians must keep this disorder in mind in patients with severe acute pancreatitis. Clinically, the abdomen may be tensely dilated, and there may be evidence of end-organ failure, which is uncommon in routine pancreatitis.[1] Mifkovic and colleagues[5] and the WSACS[4] recommend that intraabdominal pressure be measured routinely in patients with severe

acute pancreatitis to avoid missing the diagnosis of ACS. The WSACS developed a standardized protocol for measuring intraabdominal pressure that uses transvesical pressure as a surrogate instead of direct intraabdominal measurements. More details of the protocol can be found through the WSACS.[4]

The WSACS consensus guidelines outline treatment options that are supported by recent studies. Any patient in whom ACS is suspected requires transfer to an ICU for further care, but initial noninvasive treatment can start anywhere, including rural hospitals. Increasing intraabdominal pressure can be prevented by decreasing fluids after the first 48 hours of resuscitation, avoiding positive fluid balance if possible, and considering hypertonic or colloid fluids.[3–6] As for minimally invasive techniques, percutaneous drainage of intraabdominal fluid lowers intraabdominal pressure.[4,5,7] Finally, definitive management requires surgical decompression via laparotomy, which significantly reduces mortality rates in ACS.[4] In fact, hemodynamic and respiratory improvement can be immediate.[7]

Our case highlights systemic barriers to timely care. The patient was flown multiple times by an emergency air transfer service and required emergency CT at another hospital, and her case involved telephone consultations by multiple specialists and the provincial emergency referral service, yet her condition continued to deteriorate owing to a lack of resources both in the outlying hospital and in the hospitals to which she was to be transferred. Relatively simple initiatives such as funding imaging facilities (e.g., CT, or at minimum, ultrasonography) in rural hospitals and consideration of priority acceptance of rural patients with acute conditions by tertiary centres may dramatically improve patient care and outcomes. Of course, the addition of acute care beds in larger centres would facilitate faster transfers, as our patient was accepted but could not be transferred because of a lack of bed availability. Waiting hours for transport when an accepting physician and bed have been found confounds the situation faced by patients and physicians in rural and remote hospitals.

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Rural physician scholars: archetypes creating change

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Change will not come if we wait for some other person, or if we wait for some other time. We are the ones we've been waiting for. We are the change that we seek. — Barack Obama

RESEARCH: A TOOL FOR CHANGE

Recently, Peter Hutten-Czapski[1] questioned whether rural physician scholars represent the anathema or archetype of rural practitioners. Key to his debate was the idea that "the work of dealing with the medical needs of the community, despite limited resources, can and must remain central." Rural physicians are undeniably crucial to their communities, providing the 6 million Canadians currently living in rural communities with health care close to home[2] through hands-on clinical work that brings them in direct contact with patient, family and community issues.

Although the exact issues vary by community, what remains constant is that rural physicians are indeed at the "coalface"[1] and are uniquely positioned as problem-solvers. Their role transcends health care: they are advocates who resolve issues (health care–related or otherwise) relevant to their place of practice, and thus their research goal is not to expand their résumé but, rather, to discover solutions for their communities' problems. As such, research is for the greater good — a tool for change that promotes more meaningful and effective care in communities. It is evident that rural communities can be academic centres of excellence,[3] teaching patient-centred care guided by physicians, and the same could be true of rural research.[4] We are on the horizon of this change.

ROAD LESS TRAVELLED: THE JOURNEY TO CREATE CHANGE

If rural physicians have a proclivity for research that may substantially benefit their communities, why are research-keen rural practitioners a rare breed? Rural physicians tend not to engage in research owing to a variety of barriers, including time constraints and geographical and professional isolation.[5] Ultimately, these barriers preclude rural physicians — arguably the most knowledgeable experts in rural medicine — from conducting studies to identify solutions and contribute to the knowledge base of the discipline. Yet rural physicians are eager to sink their teeth into research to find these solutions, and research skills training programs can be the catalysts for rural practitioners to launch a practical, quality, community-relevant research agenda.

The Faculty of Medicine at Memorial University of Newfoundland has taken decisive action to provide a resource with 6*for*6, an evidence-informed research skills training program tailored to rural physicians (https://www.med.mun.ca/6for6/).[5,6] The program annually sponsors 6 rural physicians from Newfoundland and Labrador, New Brunswick and Nunavut to attend 6 learning weekends over 1 year and empowers them to pursue an overarching research project of interest to them and of importance to the community they serve. The 6*for*6 program is having striking success empowering participants to challenge their research barriers, and participating physicians' research agendas are already

bringing innovative change to their communities and practices for the betterment of their patients. The program has had considerable success enhancing participants' advocacy for marginalized populations, developing rural-centric solutions and facilitating knowledge mobilization.

Below is a sampling of rural physicians' research projects catalyzed by 6*for*6 that epitomize the value of research in promoting change and, more important, addressing community health care needs.

Characterizing aeromedical evacuation in extremely remote Newfoundland and Labrador

In extremely remote Newfoundland and Labrador, a rural physician is enhancing the efficiency and effectiveness of aeromedical evacuation by examining medical charts to better understand patient presentations requiring aeromedical evacuation, optimize resource allocation and identify training needs for staff.[7] This physician has also received considerable research funding for new research on an integrated fracture clinic[8] and an innovative remote ultrasound supervision approach.

Implementing an antimicrobial stewardship program in rural hospitals

Antimicrobial stewardship programs are required by Accreditation Canada, but rural hospitals find it challenging to implement them owing to limited availability of infectious disease expertise and resources. A rural physician in Newfoundland and Labrador developed a rural-centred antimicrobial stewardship program based on a "time out" procedure (systemic evaluation of the need for ongoing treatment after a set period of initial treatment)[9,10] and successfully overcame barriers to its implementation in hospitals in a remote health region. A quality-improvement study confirmed preliminary success of the program, which received Accreditation Canada approval in 2015 and is now being expanded to a third hospital.[10]

Arsenic in community well water: a community health mobilization initiative

Until 2014, citizens in a rural Newfoundland and Labrador community were unknowingly drinking water contaminated with unsafe levels of arsenic, a class 1 carcinogen. Alongside the community, the local physician participated in a community health mobilization initiative to address the issue using a validated step-based community engagement strategy.[11] This engagement unified community, health care and government stakeholders to identify and implement community-relevant solutions to the arsenic problem. The community's physician has been awarded a grant for future community-oriented research on the arsenic issue and has published an article highlighting water-quality issues in rural Newfoundland and Labrador and a strategy to tackle them.[12]

RURAL PHYSICIAN SCHOLARS: ARCHETYPES AND ARCHITECTS OF CHANGE

Rural scholarship is not bench science. It is purposeful in addressing community needs with evidence-based solutions. Currently, 18 research projects by rural physicians have been generated by 6*for*6, and this is expected to double by 2020. Rural physicians are capable scholars needing only support and their own determination to become architects of meaningful change in their communities.

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Change in scope of practice

I write to correct a statement included in the President's Message[1] in the Summer 2017 issue pertaining to the College of Physicians and Surgeons of Ontario's Changing Scope of Practice draft plan for physicians not certified in emergency medicine (EM) who intend in future to include emergency medicine as part of their practice.

The college's draft plan does not require that "all but 'grandfathered' physicians working in Ontario emergency departments ... have EM or FRCP designations."[1] Rather, the goal is to ensure that individual physicians without EM certification who plan to include emergency medicine as part of their practice in any setting (including rural) be equipped with adequate training and experience in relevant acute care settings. For these physicians, the process is similar to any change of scope plan: there is a period of graduated supervision during which the physician is supported by his or her supervisor and the community, and the physician is given increasing responsibility as skills develop.

The college's draft plan also explicitly states that family medicine residents with substantial integrated rural and acute care training experience who want to practise in a similar rural environment when they complete their training are not required to report a change in scope of practice, nor are physicians who already include emergency medicine as part of their practice.

Last, I emphasize that every case of change in scope of practice is handled individually in arriving at a suitable training plan. The plan is based on the particular physician's prior training and/or practice experience in emergency medicine and on factors such as human and other resources available in the physician's practice setting.

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