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VOLUME 18, NO. 3, SUMMER 2013

VOLUME 18, N° 3, ÉTÉ 2013

IN THIS ISSUE / DANS CE NUMÉRO

Open up to a new LAAC option in COPD

IMPROVED PATIENTS' QUALITY OF LIFE

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

NEW ONCE-DAILY Pr SEEBRI* BREEZHALER*

DEMONSTRATED 5-MINUTE ONSET AND 24-HOUR BRONCHODILATION

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

Indication & clinical use:

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

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

Relevant warnings and precautions:

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

For more information:

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

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

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

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

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

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

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VOL. 18, NO. 3, SUMMER / ÉTÉ 2013

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THE PRACTITIONER / LE PRATICIEN

NEWS / ACTUALITÉS

Grant Kernan, AK Photos

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Hand-built ceramic sculpture, approximate size of grouping of 2: 34×26×21 cm, by Paula Cooley
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"Inspired by prehistoric cave paintings, my stags are hand built from clay. The smaller stag was gas fired and the larger stag, salt fired."

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Summer in the country

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A torpid fugue has descended on me. Oh, it could be that I have been on call this weekend (it only takes the opening of the fishing season for me to get called in to remove a fish hook from somebody's body), or perhaps it's that I am not recovering as quickly as I think I should from a little bicycle mishap, of which we will speak no more. However, on reflection, this state of mind is probably mostly because summer is upon us.

It's not just me — committees at the hospitals I have worked at have long had the habit of adjourning this time of year, for commonly understood, but unwritten, reasons. And it's not just doctors — the whole community seems to perceptively change gears for the warmer weather. The slower pace of life is a well-known characteristic of rural life, and around here we become *really* laid back in summer.

I am not sure why this is the case. The change in the season changes the nature of the chores, from snow shovelling to lawn mowing. The sports change from cross-country skiing to golf. None of this should require a change in, well, the temporal speed of life experienced. Yet, the change of season inevitably and profoundly does.

Nurses know that when they call me at home, unless I am on call, some evenings my wife will answer that to reach me they will have to call again after sundown (when I have tied up the boat). My patients know to expect a few extended weekends and closed weeks at the office. That's what I call protected time.

Oh, we are not irresponsible when we do this — the usual work carries on, the emergency department is particularly busy and needs attention, and I have an editorial to write. Lucky for me, it doesn't have to be hard hitting every issue. After all, the wind is coming up, and I have an itch to raise the mainsail. I'll be back before sundown.

L'été à la campagne

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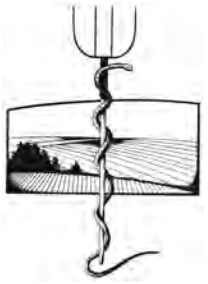
Un sentiment de torpeur et une envie de fugue s'abattent sur moi. Oh, c'est peut-être que j'étais de garde ce week-end (il suffit que la saison de la pêche ouvre pour que l'on m'appelle pour aller enlever un hameçon sur une partie du corps de quelqu'un). C'est peut-être aussi que je ne me rétablis pas aussi rapidement que je pensais d'un petit incident à vélo dont nous ne parlerons plus. Cependant, à bien y penser, cet état d'esprit est probablement attribuable surtout à l'été qui est à nos portes.

Je ne suis pas le seul à être habité par ce sentiment — les comités dans les hôpitaux où j'ai travaillé ont depuis longtemps l'habitude d'ajourner à cette époque de l'année pour des raisons communément comprises, mais non officielles. Et cet état n'est pas non plus réservé aux médecins — la communauté tout entière semble changer de vitesse pendant la période des chaleurs estivales. Le rythme plus lent est une caractéristique bien connue de la vie rurale et ici, nous sommes vraiment décontractés en été.

Je ne sais pas exactement pourquoi c'est le cas. Le changement de saison apporte un changement de tâches, passant du pelletage de la neige à la tonte du gazon ... et un changement de sport ... du ski de fond au golf. Rien de tout cela ne devrait nécessiter une modification de ... vitesse temporelle, disons ... dans notre vie. Et pourtant, le changement de saison provoque inévitablement et profondément cet effet.

Les infirmières savent quand elles m'appellent à la maison (à moins que je sois de garde) que certains soirs, ma femme leur dira que pour me joindre, elles devront rappeler après le coucher du soleil (quand j'aurai amarré le bateau). Mes patients sont habitués à de longues fins de semaine et à des semaines durant lesquelles le bureau sera fermé. C'est ce que j'appelle du temps protégé.

Bien entendu, nous ne sommes pas irresponsables lorsque nous faisons cela. Le travail habituel se poursuit, les salles d'urgence sont particulièrement bondées et il faut s'en occuper, et j'ai un éditorial à écrire. Heureusement pour moi, il n'est pas nécessaire que l'éditorial soit percutant à chaque numéro. Après tout, le vent se lève et j'ai envie de lever la voile. Je serai de retour avant le coucher du soleil.



President's message. *Multitudo sapientium sanitas orbis**

See related news article on page 107.

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These title words are very relevant as a description of what we were trying to achieve with our recent Rural and Remote Medicine Course. They are also the motto of the University of Victoria, on whose doorstep we had our most successful annual conference yet, attended by more than 900 rural physicians, residents, students, nurses, spouses and children. The theme of the conference was "Sea to Sea to Sea," emphasizing the breadth of rural practice in Canada. It was great to see the attendees engage in the great variety of workshops, the coffee breaks, meals and other entertainment, as well as make new friends and rekindle old friendships. The multitude of residents and students brought youthful enthusiasm and a breath of fresh air to the gathering. The event is organized and taught by rural doctors, which makes the information that much more relevant.

The cardinal thread that ran throughout the conference was the generalism evident in all the talks and workshops. The concept of "rural generalist medicine" acknowledges that there is a difference in a rural scope of general practice or family medicine, in breadth, context, independence and other elements. The selection of students for rural medicine was also discussed in several talks and panels. It was clear from the different perspectives that nobody really knows how to ensure that students end up in rural areas as physicians, except to note that a rural background is still the single most important predictor of working in a rural area, followed by rural exposure at an early stage of medical careers.

According to feedback received, this conference was an enormous success, especially with more interest from rural and remote nurses, and we will be hard pressed to improve on it next year in Banff, Alta.

At this year's conference, the SRPC had an executive meeting, an annual general meeting and a meeting of former presidents. At these meetings a consensus was obtained for the SRPC to pursue generalism in family medicine, as well as a rural curriculum. Establishing a college of rural medicine with certification criteria would accomplish this, but it is likely more practical and collegial to have a core curriculum in rural medicine recognized by The College of Family Physicians of Canada. This is the final frontier for the SRPC.

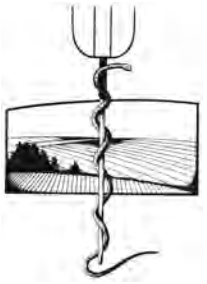
We look forward to working together on the various fronts as we address our collective medical and social responsibility to ensure ongoing and ever-improving services to citizens in rural and remote areas of Canada, while providing the right training and satisfying careers for those who serve.

I will end by quoting Sir William Osler: "It cannot be too often or too forcibly brought home to us that the hope of the profession is with the men [I would add "and women"] who do its daily work in general practice."[1]

REFERENCE

1. Oslerisms. Life in the fast lane [website]. Available: http://lifeinthefastlane.com/resources/oslerisms/ (accessed 2013 June 5).

*A multitude of the wise is the health of the world.



Message du président. *Multitudo sapientium sanitas orbis**

Voir l'article connexe à la page 107.

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Ce titre est particulièrement pertinent pour décrire ce que nous essayons de réaliser avec notre récent cours sur la médecine en milieu rural et éloigné. C'est également la devise de l'Université de Victoria, où nous avons récemment tenu notre congrès annuel le plus réussi à ce jour, et auquel ont participé plus de 900 médecins, résidents, étudiants, infirmières, conjoints et enfants des milieux ruraux. Le thème du congrès, « Entre 3 océans », mettait en évidence l'ampleur de la pratique rurale au Canada. C'était formidable de voir les participants prendre part à une grande variété d'ateliers, aux pauses café, repas et autres formes de divertissements, raviver de vieilles amitiés ou en nouer des nouvelles. Les nombreux résidents et étudiants présents ont apporté un enthousiasme juvénile et une bouffée d'air frais au congrès. L'événement est organisé par des médecins ruraux, qui donnent aussi l'enseignement, ce qui rend le contenu d'autant plus pertinent.

Le fil conducteur présent tout au long du congrès était le généralisme, sujet bien en évidence dans toutes les discussions et tous les ateliers. Le concept de « médecine généraliste rurale » reconnaît que la médecine générale ou familiale rurale diffère par son envergure, son ampleur, son contexte, son indépendance et autres éléments. La question de la sélection des étudiants pour la médecine rurale a également été abordé dans plusieurs débats et panels. Il est ressorti clairement des différents points de vue entendus que personne ne sait vraiment comment inciter les étudiants en médecine à choisir d'exercer leur profession en milieu rural. On a toutefois constaté que la provenance d'un milieu rural est toujours le facteur prédictif le plus important de l'exercice de la médecine dans ce milieu, suivi d'une exposition au milieu rural dès le début de la carrière médicale.

Si l'on se fie aux commentaires reçus, ce congrès a été un énorme succès. Il a su attirer entre autres plus d'infirmières des régions rurales et éloignées. Il nous sera certes difficile de faire encore mieux l'an prochain, à Banff, en Alberta.

Au congrès de cette année, la SMRC a tenu une réunion du comité exécutif, une assemblée générale annuelle ainsi qu'une réunion des anciens présidents. Lors de ces réunions, les participants en sont arrivés à un consensus voulant que la SMRC poursuive le généralisme en médecine familiale, ainsi qu'un programme d'études axé sur la médecine rurale. La création d'un Collège de médecine rurale et de critères de certification permettrait d'atteindre cet objectif, mais il est probablement plus pratique et collégial d'offrir un tronc commun en médecine rurale reconnu par le Collège des médecins de famille du Canada. C'est la dernière frontière pour la SMRC.

Nous sommes impatients de travailler ensemble sur divers fronts concernant notre responsabilité sociale et médicale collective afin d'assurer des services continus et toujours meilleurs pour les citoyens des régions rurales et éloignées du Canada, tout en offrant une formation et des carrières gratifiantes pour ceux et celles qui desservent ces régions.

Je termine en citant Sir William Osler : « On ne saurait répéter trop souvent ou trop énergiquement que l'espoir de la profession réside chez les hommes [j'ajouterais "et les femmes"] qui font son travail au quotidien en médecine générale. »[1]

RÉFÉRENCE

1. Oslerisms. Life in the fast lane [site web]. Disponible ici: http://lifeinthefastlane.com/resources/oslerisms/ (consulté le 5 juin 2013).

*La multitude des sages est le salut du monde.

PrONBREZ* BREEZHALER*

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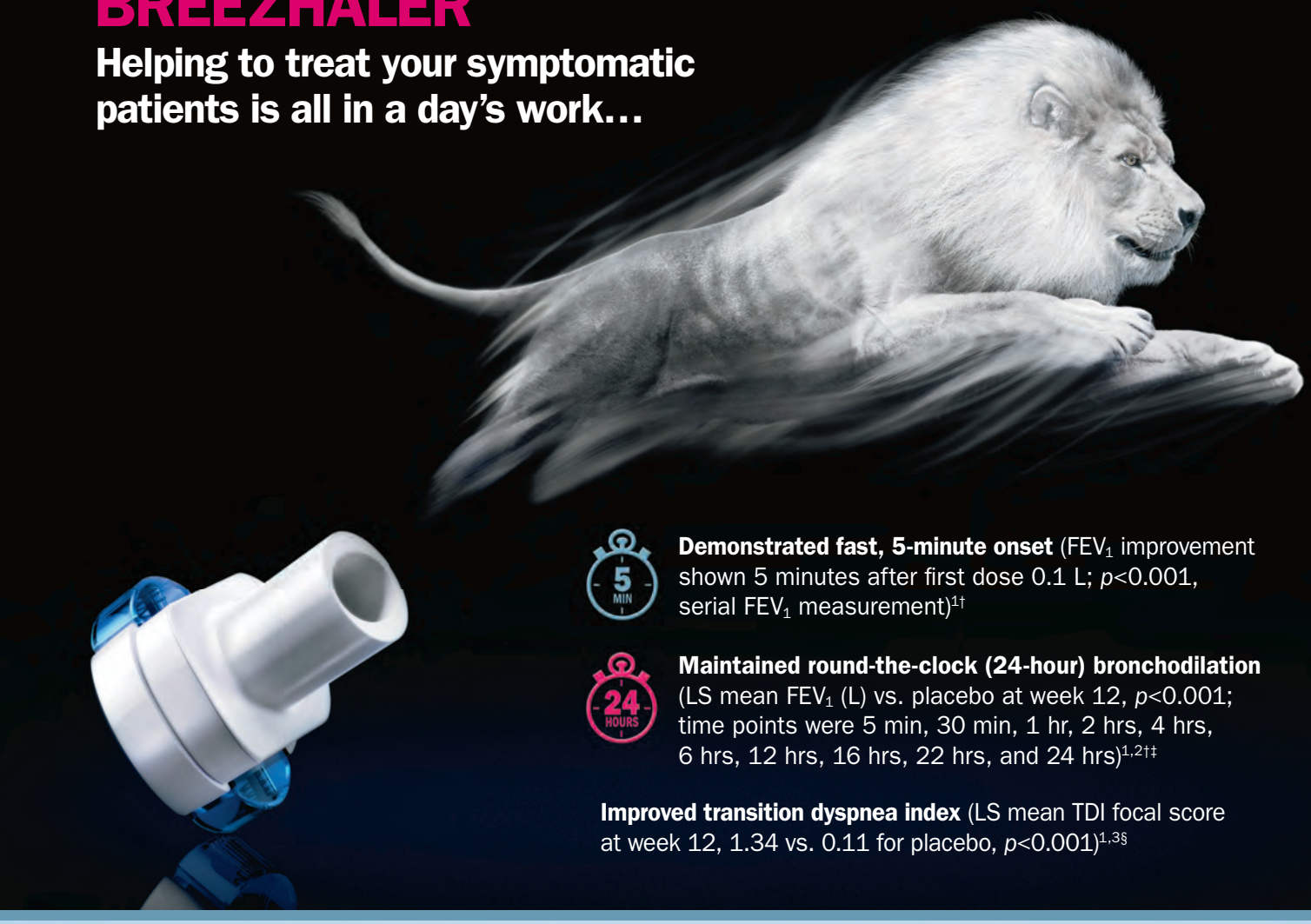

Demonstrated fast, 5-minute onset (FEV_1 improvement shown 5 minutes after first dose 0.1 L; $p<0.001$, serial FEV_1 measurement)[1†]

Maintained round-the-clock (24-hour) bronchodilation (LS mean FEV_1 (L) vs. placebo at week 12, $p<0.001$; time points were 5 min, 30 min, 1 hr, 2 hrs, 4 hrs, 6 hrs, 12 hrs, 16 hrs, 22 hrs, and 24 hrs)[1,2†‡]

Improved transition dyspnea index (LS mean TDI focal score at week 12, 1.34 vs. 0.11 for placebo, $p<0.001$)[1,3§]

ONBREZ* BREEZHALER* The only ONCE-DAILY LABA in COPD¶

Indication & clinical use:

ONBREZ* BREEZHALER* (indacaterol maleate) is a long-acting β_2-agonist (LABA) indicated for long-term, once-daily, maintenance bronchodilator treatment of airflow obstruction in patients with chronic obstructive pulmonary disease (COPD), including chronic bronchitis and emphysema.

- Not indicated for the relief of acute deterioration of COPD, for asthma, or for use in patients under 18 years of age

Contraindications:

- Not indicated for treatment of asthma

Most serious warnings and precautions:

Asthma-related death: Increased risk of asthma-related death is considered a class effect with LABAs, including indacaterol maleate. ONBREZ* BREEZHALER* is not indicated for asthma.

Other relevant warnings and precautions:

- Not indicated for acute episodes of bronchospasm
- Increased risk of cardiovascular effects
- Caution in patients with cardiovascular disorders
- Caution in patients with convulsive disorders, thyrotoxicosis and patients who are unusually responsive to β_2-adrenergic agonists
- Risk of hypokalemia and hyperglycemia
- Paradoxical bronchospasm
- Immediate hypersensitivity
- Should not be used in patients with acutely deteriorating COPD
- Should not be used concomitantly with other LABAs
- May inhibit labour

For more information:

Please consult the Product Monograph at www.novartis.ca/asknovartispharma/download.htm?res=onbrez%20breezhaler_scrip_e.pdf&resTitleId=482 for important information relating to adverse events, drug interactions, and dosing information which have not been discussed in this piece. The Product Monograph is also available by calling the Medical Information department at 1-800-363-8883.

FEV_1: forced expiratory volume in 1 second; LS: least square; TDI: transition dyspnea index.

† B2355: A 12-week, multicentre, randomized, double-blind, placebo-controlled, parallel-group study assessing the safety and efficacy of ONBREZ* BREEZHALER* 75 mcg once daily vs. placebo in patients with COPD (n=318).

‡ From a subset of 239 patients in B2355. FEV_1 data shown is ONBREZ* BREEZHALER* vs. placebo, respectively: **5 min:** 1.56 vs. 1.39; **30 min:** 1.57 vs. 1.38; **1 hr:** 1.56 vs. 1.38; **2 hrs:** 1.56 vs. 1.37; **4 hrs:** 1.51 vs. 1.35; **6 hrs:** 1.48 vs. 1.33; **12 hrs:** 1.43 vs. 1.29; **16 hrs:** 1.39 vs. 1.24; **22 hrs:** 1.44 vs. 1.27; **24 hrs:** 1.48 vs. 1.34.

§ B2354: A 12-week, multicentre, randomized, double-blind, placebo-controlled, parallel-group study assessing the safety and efficacy of ONBREZ* BREEZHALER* 75 mcg once daily vs. placebo in patients with COPD (n=323).

¶ Comparative clinical significance has not been established.

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Original Article
Article original

First practice: family physicians initially locating in rural areas

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This article has been peer reviewed.

Introduction: This paper quantifies the proportion of family physicians in rural practice and, in particular, initial rural practice. It examines differences between graduates of Canadian and international medical schools.
Methods: The Canadian Medical Association postal code master file was used to determine the distribution in rural practice of Canadian and international medical school graduates for every other year from 2000 to 2011. The master file maps practice postal codes into a census metropolitan area or census agglomeration; physicians practising outside these areas are considered rural. Initial practices were estimated based on year of undergraduate medical degree.
Results: Two-thirds of family physicians practising rural medicine in 2011 were graduates of Canadian medical schools. However, between 2000 and 2011, a greater proportion of international medical graduates were practising in rural areas than graduates of Canadian medical schools. International graduates were more likely to initially locate in a rural area, but the drop-off rate was greater among them than with graduates of Canadian medical schools. The proportion of international medical graduates setting up rural practices was decreased among more recent graduation cohorts. The proportion of Canadian medical school graduates initially practising in rural areas was steady.
Conclusion: The results of this study suggest that graduates of international and Canadian medical schools treat rural practice differently. International graduates may decide on a rural location as a means to set up practice in Canada or fulfill a return-of-service obligation, whereas graduates of Canadian medical schools may make a conscious choice to practise in rural locations. Decreasing proportions of international medical graduates in rural practice may be a result of increased opportunities for Canadian postgraduate training and full licensure.

Introduction : Ce document quantifie le pourcentage des médecins de famille qui exercent en milieu rural et, plus particulièrement, qui commencent à pratiquer en milieu rural. Il analyse les différences entre les diplômés de facultés de médecine canadiennes et étrangères.
Méthodes : Les chercheurs ont utilisé le fichier principal par code postal de l'Association médicale canadienne pour déterminer la répartition, en médecine rurale, des diplômés de facultés de médecine canadiennes et étrangères aux 2 ans, de 2000 à 2011. Le fichier principal établit la concordance entre les codes postaux des cabinets et les régions métropolitaines de recensement ou une agglomération de recensement. Les médecins qui exercent en dehors de ces régions sont considérés comme des médecins ruraux. On a calculé le début de l'exercice en fonction de l'année d'obtention de diplôme du premier cycle en médecine.
Résultats : Deux tiers des médecins de famille pratiquant la médecine rurale en 2011 étaient diplômés de facultés de médecine canadiennes. Entre 2000 et 2011, le pourcentage des diplômés de facultés de médecine étrangères qui exerçaient en milieu rural dépassait toutefois celui des diplômés de facultés de médecine canadiennes. Les diplômés de l'étranger étaient plus susceptibles de s'installer au début dans une région rurale, mais le taux d'abandon était plus élevé chez eux que chez les diplômés de facultés de médecine canadiennes. Le pourcentage des diplômés de facultés de médecine étrangères qui établissent une pratique en milieu rural a diminué dans les cohortes plus récentes de diplômés.

Le pourcentage des diplômés de facultés de médecine canadiennes qui commencent à exercer en région rurale a été stable.
Conclusion : Les résultats de l'étude indiquent que les diplômés de facultés de médecine étrangères et canadiennes abordent différemment la pratique en milieu rural. Les diplômés de l'étranger peuvent choisir un endroit rural comme moyen d'ouvrir un cabinet au Canada ou de s'acquitter de leurs obligations de remboursement de temps, tandis que les diplômés de facultés de médecine canadiennes peuvent choisir délibérément de pratiquer en milieu rural. Le pourcentage à la baisse des diplômés de facultés de médecine étrangères qui exercent en milieu rural peut découler d'une augmentation des possibilités de formation postdoctorale au Canada et de l'obtention du permis d'exercice complet.

INTRODUCTION

According to a 2011 mapping of physician practice postal codes, about 15% of family physicians worked in rural areas of Canada, defined as being outside a census metropolitan area or census agglomeration.[1]

Various studies have profiled rural physicians, and some have shown that growing up or having had postgraduate training in a rural area increases the likelihood of rural practice.[2–4] One study also showed that factors related to practice and lifestyle were more important than financial incentives in attracting and retaining rural physicians.[5] A small study involving family medicine residents at the University of Calgary found that residents from the rural stream had no long-term plans to establish rural practices.[6]

This paper attempts to quantify what proportion of new physicians, or physicians who are new to Canada, made rural Canada their initial practice location and what percentage remained 5 to 10 years later. It examines aggregate point-in-time counts of practising physicians as well as individual cohorts of medical graduates who have begun their practice in a rural setting, either after exiting a Canadian postgraduate education program, or via a special licence in the case of some international medical graduates.

METHODS

The Canadian Medical Association postal code master file was used to determine the overall distribution in rural practice of Canadian and international medical school graduates for every other year from 2000 to 2011. This file includes the mapping of the postal codes of all practising physicians into various geographical subdivisions, provided by a special request to Statistics Canada. With this file, rural physicians are defined as those with practice postal codes that are not part of either a census metropolitan area or a census agglomeration.

Census metropolitan areas are large urban centres with populations greater than 100 000, based on the last census. A census agglomeration has a population greater than 10 000 and includes areas that have a high degree of social and economic integration with the urban core. The Society of Rural Physicians of Canada routinely posts counts based on this definition on their website.[7] This definition of rural is by no means perfect and may exclude communities, such as Whitehorse (with a population of about 23 000), that may face many (or more) of the same issues as physicians in less densely populated areas.

Initial family practices were estimated through the use of the year of graduation from medical school. This approach can make use of the Canadian Medical Association postal code master file, which defines rural as being outside a census metropolitan area or census agglomeration rather than the increasingly inaccurate method of the second digit of the postal code being zero. This approach also ensured the inclusion of international medical graduates both exiting Canadian postgraduate training programs and setting up rural practice without Canadian postgraduate training.

The limitation of this master file is that it does not contain information on the year physicians completed their postgraduate education, only the year they completed their undergraduate education. In the case of Canadian medical school graduates, however, the year of undergraduate medical degree can provide a good indication of when they begin their careers in family medicine by estimating 3 to 4 years after graduation. Time to Canadian licensure among international medical graduates may vary.

RESULTS

Family physicians in rural practice

Of the 5408 physicians identified as practising outside a census metropolitan area or census agglomer-

ation in 2011, 3608 (two-thirds) completed their undergraduate medical education in Canada. The remaining third graduated either from a medical school outside of Canada (29%) or had an unknown place of graduation (4%).

The number of family physicians included in this study varies depending on the year of graduation and the year of the practice location being tracked. In the 2011 postal code file, for example, the graduation year cohorts being studied varied in size from 490 to 546 for graduates of Canadian medical schools, and from 27 to 157 for international medical graduates. Although some groups are small, they include all licensed physicians with a valid Canadian address at the time.

When examining graduates of Canadian and international medical schools as separate groups, a greater proportion of international graduates were in rural practice during the periods examined than graduates of Canadian schools (Fig. 1).

By 2011, both groups saw a decrease in the percentage of family physicians practising in rural areas. The gap between the groups narrowed somewhat owing to a slightly greater drop in international medical graduates practising in rural areas compared with graduates of Canadian medical schools.

In 2011, the proportions of family physicians in rural practice varied greatly by jurisdiction, with 65% of international medical graduates in Newfoundland and Labrador practising in rural areas, compared with only 5% in Ontario. Graduates of Canadian medical schools had the strongest presence in rural Nova Scotia and New Brunswick. Ontario had the smallest proportion of Canadian medical school graduates practising family medicine in rural areas (Fig. 2).

Whereas the overall figures are interesting, they illustrate only part of the picture. Much detail is lost when looking at aggregate figures involving physicians with varying times in practice. To better understand the flow into and out of rural practice, an examination of initial family practices is needed.

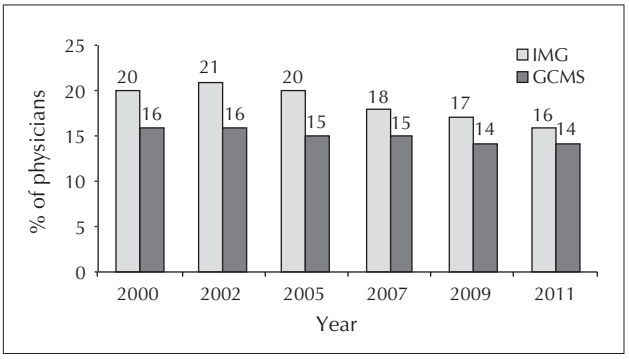

Fig. 1. Percentage of international medical graduates (IMGs) and graduates of Canadian medical schools (GCMS) practising family medicine in rural areas from 2000 to 2011.

Initial family practice in rural areas

International medical graduates

For many international medical graduates, the initial route to licensure in Canada is through an opportunity to practise in a rural or underserviced area. Even some who have completed Canadian postgraduate training and are fully certified by The College of Family Physicians of Canada or the Collège des médecins du Québec may be required, as a condition of that training, to provide services in communities in need for a set period. This will include but not necessarily be limited to rural areas.

International medical graduates without Canadian postgraduate training may not at first have full licensure that would allow for mobility within and

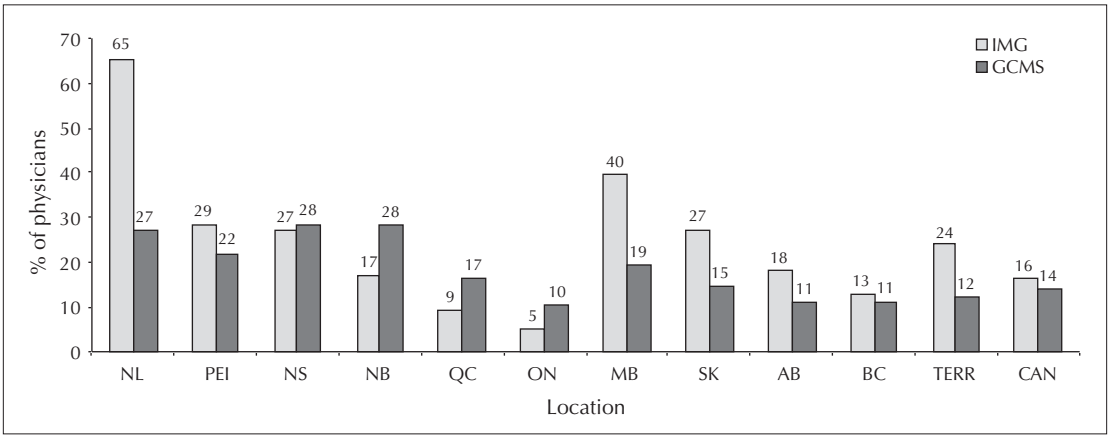

Fig. 2. Percentage of international medical graduates (IMGs) and graduates of Canadian medical schools (GCMS) practising family medicine in rural areas in 2011, by province or territory. TERR = Yukon Territory, Northwest Territories and Nunavut.

outside their jurisdiction. They may be required to stay in a rural community and practice under a supervised licence until they can achieve certification or an alternate recognition of credentials and experience to acquire a full licence.

Figure 3 illustrates the proportion of international medical graduates in rural practice at a particular point in time, by year of graduation from medical school. For example, among those who graduated from medical school in 2001, 77% were in rural family practice in 2005. Among more recent graduates, there appears to be a smaller proportion initially locating in rural areas. Well under half of the 2003 and 2004 graduation cohorts were practising in rural areas in 2007.

Also illustrated by Figure 3 are the trends in international medical graduates setting up and remaining in rural practices based on recent graduation cohorts. Over half (57%) of the international medical graduates who graduated from medical school in 2000 were practising in a rural area in 2005. By 2011, fewer than 1 in 5 (18%) of these graduates were in rural practice. A similar pattern can be seen for the 2001 and 2002 graduation cohorts, with a substantial drop-off rate within 6 years. The 1993 graduation cohort (not shown), had 69% in rural practice in 1998, but only 14% by 2011.

Graduates of Canadian medical schools

The pattern exhibited by graduates of Canadian medical schools differs markedly from that of international medical graduates (Fig. 4). Although the actual volume of Canadian medical school graduates locating in rural areas exceeded that of international medical graduates, proportionally fewer Canadian graduates were practising in rural areas. For instance, 13% of the 2002 graduation cohort was in a rural practice in 2007 (Fig. 4) compared with 58% of international medical graduates who graduated in the same year (Fig. 3). However, 59 graduates of Canadian medical schools are represented compared with only 18 international medical graduates.

For almost every graduation cohort, the drop-off rate among Canadian medical school graduates is much less than it is among international medical graduates. This may indicate a desire to practise in rural Canada among the Canadian medical school graduates, rather than the fulfillment of an obligation. In the 1993 graduation cohort (not shown), 19% of family physicians were initially in rural practice in 1998. Thirteen years later the figure was 14%.

The percentage of Canadian medical school graduates choosing rural practice appears to be steady at about 16%, but this figure has the potential to rise shortly given that many of the graduates of the Northern Ontario School of Medicine (with its focus on rural medicine) are only now completing their postgraduate training and ready to begin practice.

DISCUSSION

The data presented in this study suggest that recent graduates of Canadian medical schools are certainly

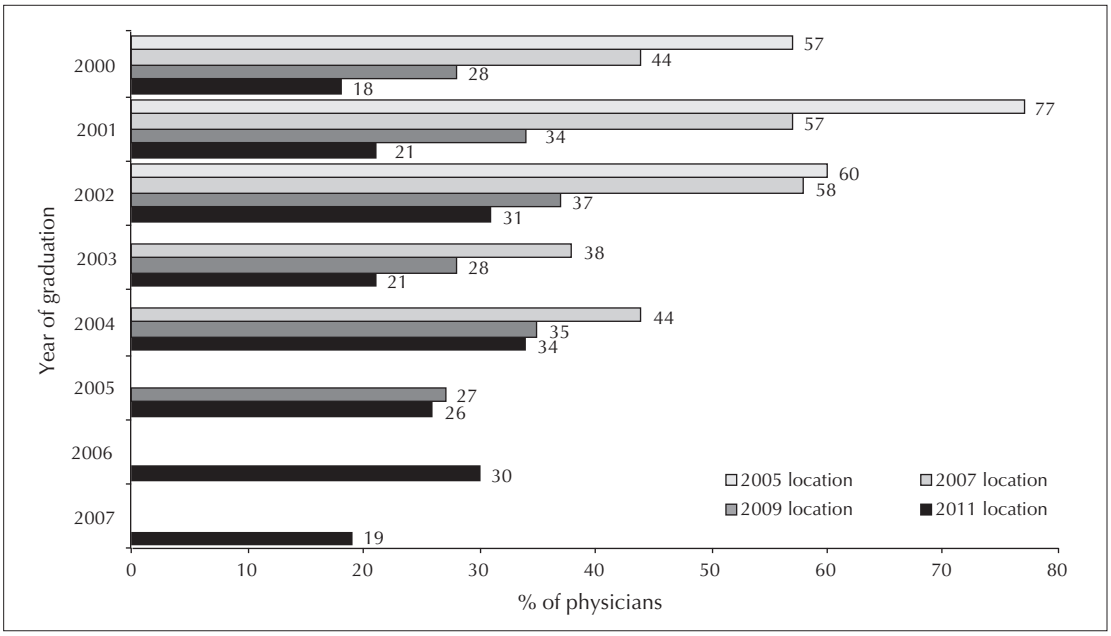

Fig. 3. Percentage of international medical graduates practising family medicine in rural areas in 2005, 2007, 2009 and 2011, by year of graduation from medical school.

not shunning rural practice and may actually be setting up practice in rural areas in larger proportions than has occurred historically. It will be interesting to track this information once graduates of the Northern Ontario School of Medicine are settled into practice. Family physicians who have decided to practise in the country instead of the city appear to be making a serious commitment in terms of retention.

Among international medical graduates, it would appear that the larger proportions of physicians locating in rural areas have lessened in recent years. This drop may be caused by the almost threefold increase in government funding for international medical graduates completing their residency in Canadian postgraduate training programs within the last decade. For provinces with a return-of-service agreement in place for international medical graduates, the graduate may be obliged only to go to an area of need, which would not necessarily be a rural community. For example, in Ontario, all communities other than Toronto and Ottawa would qualify.[8] In provinces with no return-of-service requirement, international graduates can practise in an urban setting of their choice immediately after achieving certification and licensure.

The other noticeable trend is the greater drop in international medical graduates practising in rural areas compared with graduates of Canadian medical schools. The data suggest that Canadian and international graduates approach their initial rural practices differently. Whereas both groups may receive incentives for setting up practice, international medical graduates are more likely to decide on a rural location as a means to set up practice in Canada. This is supported by a 2004 survey in which international medical graduates practising family medicine in rural areas were far more likely (60%) to indicate that the availability of a practice opportunity was one of the main reasons for selecting their current practice location compared with rural family physicians who graduated in Canada (27%).[9]

This information will be tracked to learn if graduates of Canadian medical schools maintain or increase their contribution to rural practice. With the introduction in some provinces of retention bonuses, it will be interesting to see if both Canadian and international graduates decide to stay longer in the rural communities they are currently servicing.

Limitations

The postal code file is purchased by the Canadian Medical Association only every 2 years. Five years after graduation appears to be the peak for family physicians locating in rural practice (e.g., 2005 location of physicians who graduated in 2000, 2007 location for physicians who graduated in 2002). The remaining cohorts may have peaked in years for which the postal code file was unavailable, and therefore the drop-off rates for those physicians may be understated. Regardless, the trends observed are similar among all graduation cohorts.

Tracking of cohorts by year of graduation does not necessarily track the same individuals. When a

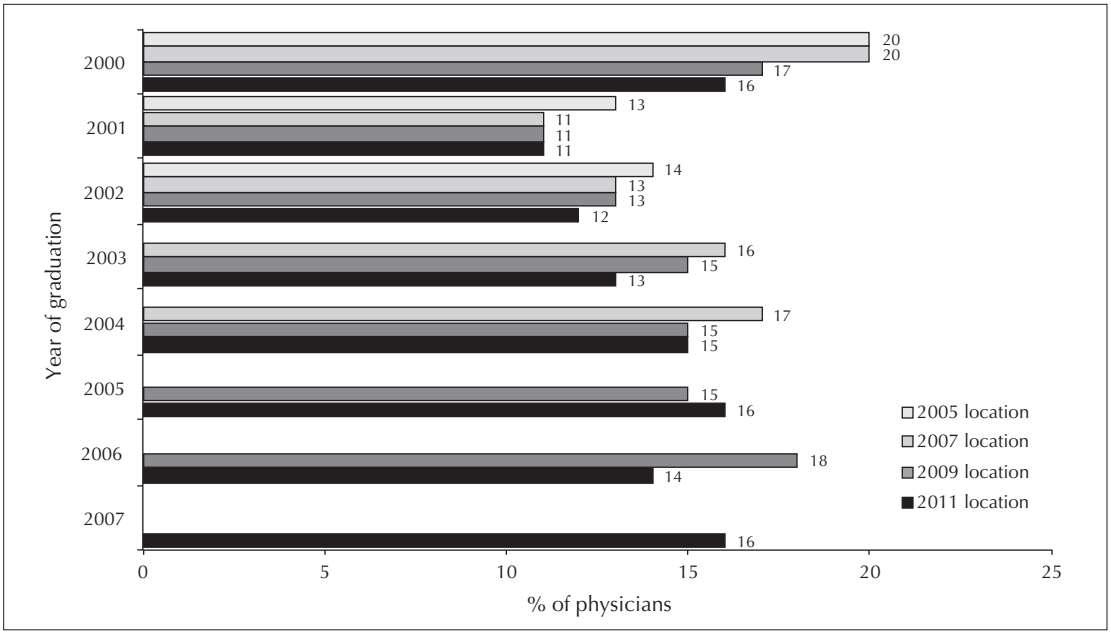

Fig. 4. Percentage of graduates of Canadian medical schools practising family medicine in rural areas in 2005, 2007, 2009 and 2011, by year of graduation from medical school.

percentage remains the same in a rural area, it does not necessarily mean people from that graduation cohort did not leave and others arrive. Also, a physician who remained in rural medicine may have migrated from one rural community to another.

CONCLUSION

Although it is recognized that there is no perfect definition of what constitutes a rural physician, within the parameters of this study, it would appear that most graduates of Canadian medical schools who choose rural medicine do so with the intention of staying longer than a couple of years. By nature of their training, they are less likely than international medical graduates to be fulfilling a return-of-service contract, although they may be receiving incentives to practise in rural areas. In provinces like Ontario, there are many cash incentives to practise in urban centres of need, so graduates of Canadian medical schools who set up a practice in a rural setting are likely doing so by choice rather than because of incentives alone.

The volume of international medical graduates in the study was smaller than that of graduates of Canadian medical schools, especially when examined by individual graduation years. It is clear, however, that many international medical graduates left rural areas within a few years. Even so, substantial proportions remained in rural practice, and the proportion of all international medical graduates practising in rural areas exceeded the proportion of Canadian graduates for all years of the study.

Clearly, both groups make a continued and important contribution to the provision of medical services in rural Canada.

Competing interests: None declared.

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Motor vehicle crashes among Canadian Aboriginal people: a review of the literature

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Introduction: Aboriginal people are substantially more likely to be injured or die in motor vehicle crashes (MVCs) than the general population. However, research examining MVCs among Canadian Aboriginal populations is limited. We examine trends and gaps in the Canadian literature and suggest priorities for future research.
Methods: We conducted a systematic review of the published and grey literature on MVCs involving Canadian Aboriginal people. We used the Haddon matrix of injury epidemiology and prevention to identify trends in crash-related risk factors.
Results: We reviewed 20 studies, which consisted of research at both national and provincial levels. We identified various risk factors related to human (e.g., male sex, substance use), vehicle and equipment (e.g., driving an older vehicle, driving a car [v. other types of vehicles]), and physical environment (e.g., occurring on-reserve, muddy and loose-gravel road conditions) variables. However, we did not find research that examined risk factors related to the social environment, such as perspectives related to MVCs.
Conclusion: This review indicates that rates of death, hospital admission and injury related to MVCs are twice as high among Aboriginal populations than the general Canadian population, which highlights a major public health concern. Priorities for future research should include examination of the social environment, more rigorous methods and collaborative research in partnership with Aboriginal communities.

Introduction : Les personnes autochtones sont beaucoup plus susceptibles que les membres de la population générale d'être victimes d'une blessure ou de mourir dans un accident de véhicule à moteur (AVM). La recherche sur les AVM dans les populations autochtones du Canada est toutefois limitée. Nous analysons les tendances et les lacunes des publications canadiennes et suggérons des priorités pour des recherches futures.
Méthodes : Nous avons procédé à une synthèse systématique des publications et de la littérature grise sur les AVM mettant en cause des personnes autochtones au Canada. Nous avons utilisé la matrice Haddon d'épidémiologie et prévention des blessures pour dégager des tendances des facteurs de risque liés aux accidents.
Résultats : Nous avons analysé 20 études comportant des recherches menées aux échelles nationale et provinciale. Nous avons dégagé divers facteurs de risque portant sur les variables relatives aux personnes (p. ex., sexe masculin, consommation de substances), au véhicule et au matériel (p. ex., conduite d'un véhicule moins récent, conduite d'une automobile [c. autres types de véhicules]), ainsi qu'à l'environnement physique (p. ex., accident se produisant dans une réserve, où les routes sont en général boueuses et en gravier). Nous n'avons toutefois pas trouvé de recherche portant sur les facteurs de risque liés à l'environnement social comme les perspectives sur les AVM.
Conclusion : Cette synthèse indique que les taux de mortalité, d'hospitalisation et de traumatisme liés aux AVM sont 2 fois plus élevés dans les populations autochtones que dans la population canadienne en général, ce qui dégage un important problème de santé publique. Les priorités pour les recherches futures devraient inclure l'examen de l'environnement social, des méthodes plus rigoureuses et une recherche concertée menée en partenariat avec des communautés autochtones.

INTRODUCTION

Research has consistently shown high rates of unintentional injury among Aboriginal populations.[1,2] Rates of injury and death related to motor vehicle crashes (MVCs) among Aboriginal people compared with the general population are particularly alarming, and MVCs are the leading cause of unintentional death for this population in the United States.[2] However, this public health concern has not been as extensively examined in Canadian Aboriginal populations as it has been internationally, with most published research having been conducted in the US, Australia and New Zealand. To develop a better understanding of rates of injury and death related to MVCs among Canadian Aboriginal people, we examined the published and grey literature (i.e., non-peer-reviewed literature, such as federal, provincial and territorial government reports) on MVCs among Canadian Aboriginal people. In this review, the term Aboriginal refers to First Nations, Inuit and Metis people, as recognized in the Constitution of Canada. In Canada, status Indians are First Nations individuals registered with the government, who are entitled to treaty rights.[3] Group-specific data will be presented where available.

Motor vehicle crashes are a substantial cause of economic, societal and personal burden. About 10% of global mortality can be attributed to MVCs.[4] Moreover, by 2030, MVCs are projected to be either the third or fourth leading cause of global mortality, ahead of heart disease.[5] Specifically in Canada, 2209 people were killed and 172 883 were injured in an MVC in 2009.[6] Furthermore, the overall costs related to these deaths and injuries are estimated to be $25 billion a year, including direct and indirect costs.[6] It is clear that there is a high burden associated with MVCs. Because Aboriginal people experience higher rates of MVCs than non-Aboriginal people,[1] research in this area has implications for public policy in Canada.

The Haddon matrix[7] is the conceptual framework most commonly employed in the injury prevention literature and, as expanded by Christoffel and Gallagher,[8] is applicable to MVCs (Table 1[9]). This framework aids in identifying precrash, crash and postcrash risk factors. In terms of injury prevention, precrash- and crash-related risk factors hold heightened importance. Because preventing crashes is the ultimate goal, a focus is needed on precrash risk factors. However, not all crashes result in injuries; therefore, an understanding of crash-related risk factors (e.g., seat belt noncompliance) provides useful information for minimizing the occurrence of serious injuries. The Haddon matrix identifies 4 sets of factors to explain injuries: human (e.g., alcohol impairment), vehicles and equipment (e.g., regular vehicle maintenance), physical environment (e.g., presence of guard rails) and social environment (e.g., attitudes toward speeding). In this review, we employed the Haddon matrix to categorize trends existing within the published and grey literature.

This review examines trends and gaps in the national-level research on injuries related to MVCs as well as independent provincial-level research that has been conducted in Newfoundland and Labrador, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia and the Northwest Territories. Examining provincial data is important because Aboriginal communities can vary greatly based on environmental, cultural and political differences. We highlight priority areas of investigation to advise future research agendas.

METHODS

Data sources

We performed a systematic review of the published and grey research literature, following the literature search approach outlined by the Cochrane Collaboration[10] and meta-analytic methods.[11] Online resources and search terms used to identify the studies examined in this review can be found in Box 1.

Table 1. Examples of risk factors in the Haddon matrix of injury epidemiology and prevention applied to motor vehicle crashes[8,9]

Phases	Factors			
	Human	Vehicle/equipment	Physical environment	Social environment
Precrash	Driver experience Substance impairment	Speed Maintenance	Road design Speed limits	Attitudes toward speeding
Crash	Seat belt use Child restraint use	Crash protective design Occupant restraints	Presence of guard rails Other vehicles	Attitudes toward occupant restraints
Postcrash	Age of victims Health status of victims	Ease of access Fire risk	Proximity to rescue facilities	Attitudes toward emergency care in hospitals

Table adapted from Norton et al.,[9] with permission from The World Bank Publications.

Study selection

We reviewed research studies that examined the epidemiology of MVCs among Aboriginal populations in Canada. An initial search resulted in 223 studies with potential relevance. We included studies that were published after 1980 and reported at least 1 objective and quantified outcomes. We did not select studies based on metrics of overall quality (e.g., measurement error, control groups).[12] Of the 20 studies that met inclusion criteria, 13 were found in peer-reviewed journals and 7 appeared in the grey literature.

Data extraction

We extracted data based on the following categories: objective of the study, population (geographical location, Aboriginal population and sample size), data source, key findings and identified crash-related risk factors. Results from the studies were not statistically pooled because of the high heterogeneity between studies, including vast differences in study design and quality.

RESULTS

Summaries and results of the studies included in the systematic review are presented in Tables 2[13–22] and 3.[23–32]

Rates of injury and death related to MVCs

National and provincial rates

We found higher rates of injury and death from MVCs among Aboriginal populations than non-Aboriginal populations. Between 1991 and 2001, national age-standardized mortality related to MVCs among Aboriginal people ranged from 11.2 to 33.2 per 100 000 person-years at risk, compared with 3.8 to 9.4 among non-Aboriginal people.[18,19] Additionally, in western Canada during 2000, the age-standardized rate of hospital discharge for MVCs among First Nations (300 per 100 000 population) was more than double the rate among the rest of western Canada (130 per 100 000 population).[15]

Studies examining national MVC trends over time revealed some interesting findings. Trovato[22] reported an increase in mortality related to MVCs among First Nations adults during the 1980s. Other research suggests that MVC rates on Canadian reserves decreased 33.8% between 1991 and 1993.[14]

Provincial studies revealed elevated MVC rates, including elevated mortality, rates of hospital admission and injury, and injury severity, among specific Aboriginal populations compared with the rest of the province. Alaghehbandan and colleagues[23] found a higher MVC-related hospital admission rate of 277 per 100 000 population among Aboriginal people (including Metis, Inuit and Innu) compared with

Box 1. Online resources and search terms used to identify studies for review

Resources

- Academic Search Complete
- Australian Indigenous Health*Info*Net
- The Cochrane Library
- ERIC (Educational Resources Information Center)
- Google
- Google Scholar
- First Nations and Inuit Health, Health Canada
- Indian Health Service, US Department of Health and Human Services
- Indigenous Studies Portal
- Manitoba Aboriginal and Northern Affairs
- MEDLINE
- National Aboriginal Health Organization (NAHO)
- National Indian and Inuit Community Health Representative Organization (NIICHRO)
- ProQuest Dissertations and Theses Database
- PsycARTICLES
- PsycINFO
- Public Health Department of the Cree Health Board
- ScienceDirect
- Social Sciences Citation Index
- Transport Canada
- Web of Science

Search terms

- Aboriginal
- Canada
- First Nations
- Indian
- Indigenous
- Injury prevention
- Inuit
- Metis
- Motor vehicle accident
- Motor vehicle collision
- Motor vehicle crash
- Native
- Road safety
- Traffic accident
- Transport
- Unintentional injury

Table 2. Summaries and results of the national studies included in the review (part 1 of 2)

Study; source	Objective	Population (location, Aboriginal population and sample size)	Data source	Key findings	Identified precrash and crash risk factors
Allard et al.[13]; PR	To compare PYLL (before age 75) in health regions with high Aboriginal populations with other health regions	Canada; Aboriginal; "high-Aboriginal population" (≥ 19%) health regions = 18, "low-Aboriginal population" (< 19%) health regions = 120; *n* = NA	Mortality data from the Canadian Vital Statistics Database and population estimates for 1995–1997	PYLL rate for MVCs was higher in high-Aboriginal populations (9.0) than low-Aboriginal populations (3.8); rate difference = 5.2; rate ratio = 2.35	Sex PYLL caused by MVCs among males: high-Aboriginal = 12.2; low-Aboriginal = 5.4; rate difference = 6.7; rate ratio = 2.24 PYLL caused by MVCs among females: high-Aboriginal = 5.6; low-Aboriginal = 2.2; rate difference = 3.4; rate ratio = 2.54
Health Canada[14]; GL	To examine the health status and conditions of Aboriginal people living on-reserve in Canada	Canada; First Nations; *n* = NA	Data from Health Canada's First Nations and Inuit Health Branch for on-reserve Aboriginal people	Although MVCs were a leading cause of death among First Nations people, rates decreased 33.8% between 1991 and 1993	Age MVC mortality in 1999 (per 100 000): 0–9 yr = 10.0; 10–19 yr = 30.9; 20–44 yr = 35.7; 45–64 yr = 37.8; ≥ 65 yr = not a leading cause of death
Health Canada[15]; GL	To examine use of health services among First Nations people living on- and off-reserve in western Canada	Western Canada (Alberta, BC, Saskatchewan and Manitoba); First Nations; *n* = NA	Provincial hospitals administrative databases in western Canada	In 2000, the age-standardized hospital discharge rate for MVCs was higher among First Nations people (300/100 000) than the rest of Canada (130/100 000); rate ratio = 2.4	Sex Hospital discharge rates (per 100 000) for MVCs, among First Nations people: males = 320; females = 250; rate ratio = 1.3
Postl and Moffatt[16]; PR	To compare the health of Canada's Aboriginal population with the rest of the national population	Canada; Aboriginal; *n* = NA	*Medical Services Branch: Annual Report* (Health and Welfare Canada, 1978) and *Vital Statistics* (Statistics Canada, 1974)	In the 1970s, Aboriginal people had higher rates of death (60.5/100 000) than the rest of the national population (26.9/100 000)	Age Violent deaths (including MVCs) among Aboriginal people were higher than the rest of the national population for all age levels; 5–14 yr = 3 times the national rate; 15–44 yr = 4–5 times the national rate; among Aboriginal people ≥ 15 yr, the leading cause of death was MVCs (29%)
Tjepkema[17]; PR	To compare nonfatal injuries among off-reserve Aboriginal people (12–64 yr) with those of other Canadians	Canada; Metis, Inuit, First Nations and "North American Indians"; Aboriginal, *n* = 8106; non-Aboriginal, *n* = 210 655	Two cycles of Statistics Canada's Canadian Community Health Survey conducted in 2000/01 and 2003	In the provinces, Aboriginal people had higher rates of transportation crashes compared with non-Aboriginal people in 2000/01 and 2003 The amount of activity limitation due to injuries from MVCs did not differ significantly between Aboriginal and non-Aboriginal people	Residence Rates of transportation crashes in past year in the provinces: Aboriginal = 7.6%; non-Aboriginal = 6.4% Rates of transportation crashes in past year in the territories: Aboriginal = 75.1%; non-Aboriginal = NA
Tjepkema et al.[18]; PR	To compare mortality patterns among Metis and Registered Indian adults (≥ 25 yr) with those among non-Aboriginal people	Canada; Metis and First Nations Registered Indians; Metis, *n* = 11 800; Registered Indian, *n* = 56 700; non-Aboriginal, *n* = 2 624 300	1991–2000 Canadian census mortality follow-up study	Age-standardized MVC mortality (per 100 000) was higher among Metis and Registered Indians (11.2 and 21.8, respectively) than non-Aboriginal people (4.7)	Sex Age-standardized mortality among males (95% CI): Metis = 37.2 (24.2 to 57.2); Registered Indian = 51.1 (42.9 to 60.9); non-Aboriginal = 11.6 (10.9 to 12.2) Age-standardized mortality among females (95% CI): Metis = 11.2 (5.2 to 23.5); Registered Indian = 21.8 (17.3 to 27.5); non-Aboriginal = 4.7 (4.4 to 5.1)

Continued

Table 2. Summaries and results of the national studies included in the review (part 2 of 2)

Study; source	Objective	Population (location, Aboriginal population and sample size)	Data source	Key findings	Identified precrash and crash risk factors
Tjepkema et al.[19]; PR	To compare mortality patterns of urban (population ≥ 10 000) Aboriginal adults (≥ 25 yr) with those of urban non-Aboriginal people	Canada; First Nations, Inuit and Metis; Aboriginal, *n* = 16 300; non-Aboriginal, *n* = 2 062 700	1991–2000 Canadian census mortality follow-up study	Age-standardized MVC-related mortality was higher among Aboriginal males and females (33.2 and 15.6, respectively) than non-Aboriginal males and females (9.4 and 3.8, respectively)	Sex and residence Age-adjusted mortality rate ratios (95% CI) among males: all urban areas = 3.51 (2.32 to 5.32); metropolitan areas (population ≥ 100 000) = 3.67 (2.16 to 6.23); smaller urban centres (population ≥ 10 000) = 2.96 (1.51 to 5.78) Age-adjusted mortality rate ratios (95% CI) among females: all urban areas = 4.13 (2.46 to 6.93); metropolitan areas (population ≥ 100 000) = 5.24 (2.87 to 9.59); smaller urban centres (population ≥ 10 000) = 2.22 (0.82 to 6.06)
Tjepkema et al.[20]; PR	To compare mortality patterns of status Indians (25–74 yr) living on- and off-reserve with those of non-Aboriginal people	Canada; First Nations status Indians; status Indian, *n* = 55 700; non-Aboriginal, *n* = 2 475 700	1991–2000 Canadian census mortality follow-up study	PYLL rate was higher among status Indian males and females (14 676 and 8261, respectively) than non-Aboriginal males and females (5984 and 3134, respectively) Percentage of PYLL from MVCs was higher among status Indian males and females (9.9% and 6.7%, respectively) than non-Aboriginal males and females (3.4% and 2.7%, respectively)	Sex and residence Age-standardized rate ratios (95% CI) among males: total = 4.09 (3.11 to 5.37); on-reserve = 4.54 (3.37 to 6.13); off-reserve = 2.88 (1.62 to 5.15) Age-standardized rate ratios (95% CI) among females: total = 3.95 (2.78 to 5.61); on-reserve = 4.52 (3.01 to 6.77); off-reserve = 2.70 (1.56 to 4.66)
Tjepkema et al.[21]; PR	To compare mortality patterns of Metis and non–status Indians (25–74 yr) with those of non-Aboriginal people	Canada; Metis and First Nations non–status Indians; Metis, *n* = 11 600; non–status Indian, *n* = 5400; non-Aboriginal, *n* = 2 475 700	1991–2000 Canadian census mortality follow-up study	PYLL rate was higher among Metis males and females (12 025 and 6139, respectively) and non–status Indian males and females (11 480 and 8844, respectively) than non-Aboriginal males and females (5984 and 3134, respectively) Percentage of PYLL from MVCs was higher among Metis males and females (9.1% and 5.0%, respectively) and non–status Indian males and females (9.2% and 3.0%, respectively) than non-Aboriginal males and females (3.4% and 2.7%, respectively)	Sex Rate ratio (95% CI) in males: Metis = 3.12 (1.66 to 5.85); non–status Indian = 4.11 (1.62 to 10.44) Rate difference (95% CI) in males: Metis = 880 (75 to 1685); non–status Indians = 1290 (–292 to 2873) Rate ratio (95% CI) in females: Metis = 1.85 (0.82 to 4.18); non–status Indian = 1.60 (0.37 to 6.86) Rate difference (95% CI) in females: Metis = 143 (–106 to 391); non–status Indian = 100 (–280 to 488)
Trovato[22]; PR	To compare mortality patterns of status Indians with those of non-Aboriginal people during infancy (0–1 yr), early childhood (1–4 yr), late childhood (5–14 yr) and adulthood (≥ 15 yr), at 2 points in time (1981 and 1991)	Canada; First Nations status Indians 1981: Aboriginal, *n* = 279 957; non-Aboriginal, *n* = 23 777 497 1991: Aboriginal, *n* = 396 988; non-Aboriginal, *n* = 26 899 882	Mortality data (1979–1983 and 1990–1992) and population statistics (1981 and 1991) from Health Canada Medical Service Branch	MVC-related mortality among First Nations adults increased during the 1980s	Age Maximum likelihood estimates: 0–1 yr = –0.338; 1–4 yr = –3.22; 5–14 yr = –0.743; ≥ 15 yr = –0.124

CI = confidence interval; GL = published as grey literature; MVC = motor vehicle crash; NA = not available; PR = published in a peer-reviewed journal; PYLL = potential years of life lost.

Table 3. Summaries and results of the provincial studies included in the review (part 1 of 3)

Study; source	Objective	Population (location, Aboriginal population and sample size)	Data source	Key findings	Identified precrash and crash risk factors
Alaghen-bandan et al.[23]; PR	To compare unintentional injuries among children and adolescents in Aboriginal and non-Aboriginal communities	Newfoundland and Labrador; Innu, Inuit and Metis; Aboriginal, *n* = 2768; non-Aboriginal, *n* = 133 624	Provincial hospital discharge and mortality data from April 1995 to March 2001	Rate of hospital admission for MVCs: Aboriginal community, 277/100 000; non-Aboriginal communities, 158.5/100 000; rate ratio 1.75 (95% CI 1.30 to 2.43)	None
Bridges and Kunselman[24]; PR	To identify areas of health service delivery in BC for which status Indians had the highest excess premature mortality due to suicide, homicide and MVCs	British Columbia; First Nations status Indians; *n* = NA	PYLL data (before age 75) from BC Vital Statistics Agency and First Nations and Inuit Health Branch between 1991 and 2001	Rate of PYLL due to MVCs was 248% higher among status Indians than all other residents PYLL rate ranges: status Indians = 8.0–22.7; other residents = 2.0–9.9	Sex PYLL rates among status Indian males exceeded those of status Indian females PYLL rates among status Indian females exceeded those of non-Aboriginal males
BC's Office of the Provincial Health Officer[25]; GL	To compare the health and well-being of Aboriginal people with that of non-Aboriginal people living in BC	British Columbia; First Nations status Indians; *n* = 167 782	BC Ministry of Health, Indian and Northern Affairs Canada and Health Canada	MVC mortality (per 10 000) was higher among status Indians than non-Aboriginal people: 1993: status Indian = 3.5; non-Aboriginal = 1.3 2001: status Indian = 2.9; non-Aboriginal = 0.9 2006: status Indian = 1.9; non-Aboriginal = 0.7	Alcohol Proportion of MVC deaths related to alcohol between 2002 and 2006: status Indian = 41%; non-Aboriginal = 19%
Desapriya et al.[26]; GL	To examine the prevalence of, and factors related to, motor vehicle restraint use during fatal MVCs among Aboriginal people living in BC	British Columbia; Aboriginal; *n* = NA	BC Coroners Service reports of sudden and unexpected deaths from 2003 to 2005	Between 2003 and 2005, 87 Aboriginal MVC fatalities occurred in BC Drivers = 39.1%; passengers = 35.6%; pedestrians = 19.5%	Sex Males = 49.4%; females = 50.6% Age 33.3% involved people aged 16–25 yr Restraint use Using restraints = 29.2%; non-restrained = 46.2%; unknown = 24.6% Alcohol 50.8% involved alcohol Speeding 24.6% involved speeding Drugs 16.9% involved drugs (including medications) Fatigue 12.3% involved fatigue Without due care 9.2% involved careless driving

Continued

Table 3. Summaries and results of the provincial studies included in the review (part 2 of 3)

Study; source	Objective	Population (location, Aboriginal population and sample size)	Data source	Key findings	Identified precrash and crash risk factors
Desapriya et al.[27]; PR	To compare on-reserve with off-reserve MVCs in Saskatchewan between 2003 and 2005	Saskatchewan; Metis and First Nations; on-reserve collisions, *n* = 1270; off-reserve collisions (randomly selected comparison group), *n* = 1270; people involved in on-reserve collisions, *n* = 1677; people involved in off-reserve collisions, *n* = 1370	MVC data from Saskatchewan Government Insurance between 2003 and 2005	On-reserve MVCs were more severe than off-reserve MVCs OR (95% CI): personal injury, 2.63 (2.11 to 3.28); multiple collisions, 4.8 (3.75 to 6.09) On average, on-reserve MVCs had significantly more injured victims (0.41) than off-reserve MVCs (0.18)	Sex Males: on-reserve = 47.2%; off-reserve = 70.2% Females: on-reserve = 35.8%; off-reserve = 28.0% Age Individuals aged ≤ 15 yr were more likely to be involved in on-reserve than off-reserve MVCs; OR 7.53 (95% CI 2.66 to 21.3) Substance use On-reserve MVCs were more likely to involve the use of substances OR (95% CI): alcohol (BAC < 0.8) = 7.49 (4.09 to 13.7); alcohol (BAC > 0.8) = 4.87 (2.96 to 8.03); prescription or illicit drugs = 3.75 (0.42 to 33.6) Time of day More on-reserve MVCs (33.6%) occurred during the daytime, between 8:00 and 16:00 Restraint use Restraints were more likely not used or improperly used in on-reserve (40.6%) compared with off-reserve (16.5%) MVCs Additional risk factors OR (95% CI): inattentiveness = 2.02 (1.52 to 2.67); driver inexperience = 2.58 (1.80 to 3.69); too fast for conditions = 1.97 (1.38 to 2.82); vehicle year (≤ 1989) = 1.37 (1.03 to 1.83); vehicle type (car) = 1.48 (1.20 to 1.82); road surface (snow) = 1.7 (1.32 to 2.20); road surface (gravel) = 2.88 (2.10 to 3.94); road surface (mud) = 3.83 (1.83 to 8.00); intersection rural road = 1.75 (1.28 to 2.40); domestic animal interaction = 3.39 (2.01 to 5.72)
Fantus et al.[28]; PR	To compare injuries leading to hospital admission in First Nations communities with those in small (population < 10 000) northern and southern communities in Ontario	Ontario; First Nations; First Nations, *n* = 28 816; northern, *n* = 211 834; southern, *n* = 650 002	Provincial hospital discharge data from 2004	Age- and sex-adjusted hospital admission rate for MVCs (per 1000): First Nations = 1.4; northern = 1.1; southern = 1.1 Relative risk: First Nations v. northern = 1.3; northern v. southern = 1.0; First Nations v. southern = 1.2	Sex Age-adjusted hospital admission rates (per 1000) for males: First Nations = 1.7; northern = 1.6; southern = 1.5 Age-adjusted hospital admission rates (per 1000) for females: First Nations = 1.0; northern = 0.6; southern = 0.8 Relative risk: First Nations v. northern = 1.7 (female), 1.1 (male); northern v. southern = 0.8 (female), 1.1 (male); First nations v. southern = 1.3 (female), 1.2 (male)

Continued

Table 3. Summaries and results of the provincial studies included in the review (part 3 of 3)

Study; source	Objective	Population (location, Aboriginal population and sample size)	Data source	Key findings	Identified precrash and crash risk factors
Northwest Territories Health and Social Services[29]; GL	To examine the incidence and pattern of intentional and unintentional injuries in the Northwest Territories and provide a comparison with Canadian rates	Northwest Territories; Inuit, Dene and Metis; *n* = NA	Northwest Territories Vital Statistics and Canadian Institute for Health Information Discharge Abstract Database	MVC mortality rates (per 100 000) between 1990 and 1999: Dene = 22.99; Inuit = 19.4; Metis and non-Aboriginal = 8.4 MVC hospital admission rates (per 100 000) between 1995/96 and 1999/2000: Dene = 157.3; Inuit = 138.1; Metis and non-Aboriginal = 96.2	<u>Seat belts</u> Only 58% of Dene reported that they always used a seat belt
Karmali et al.[30]; PR	To compare the incidence and characteristics of severe trauma among Aboriginal adults (≥ 16 yr) with non-Aboriginal adults living in Alberta	Alberta; First Nations status Indians; *n* = NA	Calgary Health Registration between 1999 and 2002	MVC injury risk ratio comparing status Indians with non-Aboriginals: 4.8 (95% CI 3.5 to 6.5)	None
Manitoba Health[31]; GL	To examine the burden of intentional and unintentional injury in Manitoba	Manitoba; First Nations; *n* = NA	Manitoba Health	MVC mortality (per 100 000) between 1992 and 1999: First Nations = 18.2; non-Aboriginal = 9.4 First Nations hospital admission rates (per 100 000) due to MVC between 1992 and 2001 = 270.7	<u>Sex</u> MVC mortality (per 100 000) between 1992 and 1999 among males: First Nations = 24.3; non-Aboriginal = 12.6 First Nations MVC hospital admission rates (per 100 000) between 1992 and 2001 among males = 291.5 MVC mortality (per 100 000) between 1992 and 1999 among females: First Nations = 11.6; non-Aboriginal = 6.3 First Nations MVC hospital admission rates (per 100 000) between 1992 and 2001 among females = 249.8 <u>Age</u> MVC mortality rates (per 100 000) between 1992 and 1999: 0–1 yr = 0.0; 1–4 yr = 10.6; 5–9 yr = 11.9; 10–14 yr = 0.0; 15–19 yr = 31.1; 20–24 yr = 31.3; 25–34 yr = 29.8; 35–44 yr = 23.6; 45–54 yr = 18.5; 55–65 yr = 21.1; ≥ 65 yr = 0.0 First Nations males aged 20–24 had the highest MVC mortality between 1992 and 1999 (48.0/100 000) and the highest MVC hospital admission rate (573.8/100 000)
Schnarch[32]; GL	To compare the health and health determinants of Aboriginal people living in the Cree communities of Eeyou Istchee with the rest of Quebec	Quebec; Cree; *n* = NA	Quebec Ministry of Health Services between 1993 and 1997	Age-adjusted MVC mortality (per 100 000): Eeyou Istchee = 26.7, Quebec = 11.2; rate ratio = 2.4 PYLL due to MVC = 542.5	<u>Sex</u> Age-adjusted MVC mortality (per 100 000): Males: Eeyou Istchee = 27.6; Quebec = 16.0; rate ratio = 1.7 Females: Eeyou Istchee = 25.8; Quebec = 6.7; rate ratio = 3.9

BAC = blood alcohol content; CI = confidence interval; GL = published as grey literature; MVC = motor vehicle crash; NA = not available; OR = odds ratio; PR = published in a peer-reviewed journal; PYLL = potential years of life lost.

159.5 per 100 000 population among non-Aboriginal people in Newfoundland and Labrador. Fantus and colleagues[28] found a higher age-adjusted MVC hospital admission rate of 1.4 per 1000 population among First Nations communities in Ontario compared with 1.1 per 1000 population among small (population < 10 000) southern and northern communities in Ontario. In Quebec, a higher age-adjusted MVC-related death rate of 26.7 per 100 000 population was found among Cree communities of Eeyou Istchee compared with 11.2 per 100 000 population among non-Aboriginal people.[32] A government review reported a higher MVC death rate of 18.2 per 100 000 population among First Nations people compared with 9.4 per 100 000 among non-Aboriginal people in Manitoba.[31] Desapriya and colleagues[27] compared on-reserve with off-reserve MVCs and reported odds ratios (ORs) of 2.63 for personal injury and 4.8 for multiple collisions in Saskatchewan. In Alberta, Karmali and colleagues[30] compared injury incidence among First Nations and non-Aboriginal people and found that the First Nations population had an increased risk of MVC-related injury (relative risk ratio 4.8). A report from BC found higher MVC-related mortality ranging from 1.9 to 3.5 per 10 000 population among First Nations people compared with rates ranging from 0.3 to 1.7 per 10 000 among non-Aboriginal people in that province.[25] A government report found a higher MVC-related death rate of 22.9 per 100 000 population among Dene people and 19.4 per 100 000 among Inuit people compared with 8.4 per 100 000 among Metis and non-Aboriginal people in the Northwest Territories.[29]

Moreover, an interesting trend emerged in the province of BC. Although First Nations people consistently experienced higher mortality from MVCs compared with non-Aboriginal people, rates during 1993 (3.5/10 000), 2001 (2.9/10 000) and 2006 (1.9/10 000) decreased over time among First Nations people.[25] A slight decrease in MVC-related mortality among the non-Aboriginal population also emerged during this time.[25]

Collectively, this research summarizes the extent of MVC-related injuries among Canadian Aboriginal people. Specifically, with the exception of Ontario, rates of injury associated with MVCs were at least double among Aboriginal compared with non-Aboriginal populations across provinces, with some regional variation.

Potential years of life lost

Potential years of life lost (PYLL) is a common measure used in injury epidemiology research. Aboriginal life expectancy in Canada remains shorter than for the general population (males: 68.9 yr among Aboriginal people v. 76.3 yr among the general population; females: 76.6 yr among Aboriginal people v. 81.8 yr among the general population),[14] a finding at least partially attributable to causes that tend to occur relatively early in life. Therefore, this measure is suitable because it gives more weight to deaths that occur at younger ages.[13] The PYLL rate is calculated by dividing the PYLL (commonly before age 75) by the person-years at risk. A total of 5 studies, 3 national and 2 provincial, examined PYLL from MVCs among Aboriginal Canadians.

National PYLL rates among Canadian Aboriginal people ranged from 6139 (among Metis females) to 14 676 (among status Indian males) per 100 000 person-years at risk, compared with non-Aboriginal Canadian males (5984) and females (3134).[20,21] The percentages of PYLL from MVCs were also exceedingly higher among Aboriginal people, ranging from 9.9% (among status Indian males) to 3.0% (among non–status Indian females), compared with non-Aboriginal males (3.4%) and females (2.7%).[20,21] Additionally, elevated rates were reported in regions with a high Aboriginal population (9.0/1000 person-years) compared with regions with a low Aboriginal population density (3.8/1000 person-years).[13] Similar patterns were revealed in 2 provincial studies. In the Cree communities of Eeyou Istchee, Quebec, the number of PYLL due to MVCs was 542.5, and in BC the PYLL rate due to MVCs was 248% higher among status Indians than among all other residents (PYLL range: 8.0–22.7 among status Indians v. 2.0–9.9 among other residents).[24,32]

National and provincial studies conducted with Aboriginal populations support the notion that Canadian Aboriginal people have substantial premature mortality and years of life lost due to MVCs. These statistics highlight the relevance of research and program development targeted toward prevention of MVCs among Aboriginal people in Canada.

Precrash and crash risk factors

Human

Of the studies reviewed, 12 examined sex and 6 examined age as related risk factors. In the national research, higher rates of death and injury related to MVCs are consistently observed among Aboriginal males than Aboriginal females.[13,15,18–21] These studies indicate that the rates among Aboriginal females are

generally higher than the rates among non-Aboriginal males.[13,15,18–21] The pattern of higher rates among Aboriginal males versus females was also evident in most of the provincial research, including the research from Ontario, Quebec, Manitoba, Saskatchewan and BC.[24,27,28,31,32] However, one BC study found the difference in percentages between males and females was not statistically significant.[26]

The national data indicated that MVC-related mortality was the highest in adulthood. Health Canada reported the highest mortality among populations aged 20–44 years (35.5 per 100 000 population) and 45–64 years (37.8 per 100 000 population).[14] Postl and Moffatt[16] revealed that MVCs were the leading cause of death (29%) among Aboriginal people aged 15 years and older. Furthermore, being a young adult was found to be a risk factor for involvement in an MVC.[26,27,31] In Manitoba, First Nations males aged 20–24 years had the highest MVC-related mortality and rate of hospital admission.[31] Desapriya and colleagues[26] found that 33.3% of Aboriginal people in BC who died from MVCs were aged 16–25 years. Data from Saskatchewan suggest that being younger (≤ 15 yr) was a significant risk factor for involvement in an on-reserve MVC.[27]

Alcohol use was examined in 3 provincial studies, and drug use was researched in 2 provincial studies. Between 2002 and 2006 in BC, 41% of MVC-related fatalities among First Nations people involved alcohol, whereas only 19% among non-Aboriginal people involved alcohol.[25] Another BC study revealed that 50.8% of MVC-related fatalities among Aboriginal people involved alcohol, and 16.9% involved drugs, including medications.[26] In Saskatchewan, individuals involved in on-reserve MVCs had greater odds of having used substances than individuals living off-reserve, with ORs of 3.75 for drug use (i.e., prescription or illicit drugs), 4.87 for impairment by alcohol use (i.e., blood alcohol content > 0.8) and 7.49 for some alcohol use (i.e., blood alcohol content < 0.80).[27]

Although Canada has one of the highest rates of seat belt use in the world (i.e., in 2005–2006, seat belt use in Canada reached 90.8%),[33] seat belt noncompliance among Aboriginal Canadians appears to be a relevant risk factor related to MVCs. Three provincial studies examined restraint use. In Saskatchewan, Desapriya and colleagues[27] found a greater proportion of noncompliance or improper use by individuals involved in on-reserve (40.6%) than off-reserve (16.5%) MVCs. In BC, 46.2% of Aboriginal people involved in an MVC reported that they had not been restrained.[26] In the Northwest Territories, only 58% of Dene individuals reported that they always used a seat belt.[29]

Additional human risk factors have been identified, primarily relevant to awareness while driving and driver experience. For instance, Desapriya and colleagues[27] revealed that inattentiveness (OR 2.02) and driver inexperience (OR 2.58) were significant risk factors for on-reserve MVCs in Saskatchewan. Moreover, driving too fast for the conditions was related to on-reserve compared with off-reserve MVCs in this province (OR 1.97).[27] In BC, 12.3% of MVC-related fatalities among Aboriginal people involved fatigue, and 9.2% involved careless driving.[26] Moreover, this study indicated that 24.6% of MVC-related deaths among Aboriginal people involved speeding, highlighting speeding as a relevant risk factor.[26]

Vehicle and equipment

One of the reviewed studies, conducted in Saskatchewan, examined vehicle and equipment factors in relation to MVCs.[27] Results indicated that vehicle type (i.e., cars v. pickup trucks, trucks heavier than 4.5 tons, panel vans and power units for semitrailers) and vehicle year (i.e., older than 1990) were relevant factors associated with on-reserve MVCs.[27]

Physical environment

A few national studies compared MVCs among Aboriginal and non-Aboriginal people across geographic locations. Tjepkema[17] found that MVCs occurred more commonly in the territories than the provinces. In urban areas, MVC-related mortality was higher among Aboriginal than non-Aboriginal people, and although the rate ratio is slightly larger in metropolitan areas (population ≥ 100 000) than smaller urban centres (population ≥ 10 000), the pattern is consistent.[19] When examining MVCs occurring on-reserve compared with those occurring off-reserve, research indicates that MVC-related mortality is higher among First Nations people than non-Aboriginal people in both contexts; however, the rate ratio is exceedingly larger on-reserve than off-reserve.[20]

Provincial studies have also examined the physical environment. In comparing First Nations communities with small (population < 10 000) northern and southern communities in Ontario, Fantus and colleagues[28] found that females in First Nations communities had higher MVC rates than females in northern communities. Desapriya and colleagues[27]

revealed several physical environment–related risk factors pertaining to MVCs occurring on-reserve in Saskatchewan. Time of day was a factor for on-reserve MVCs; compared with off-reserve MVCs, more on-reserve MVCs occurred during the day, between 8 am and 4 pm. Other risk factors related to on-reserve MVCs included road surface (i.e., packed snow, loose gravel or muddy road), intersection with local streets and interaction with domestic animals. However, MVCs at intersections with highways and, interestingly, MVCs that involved interaction with wild animals were significantly less likely on-reserve than off-reserve.

Social environment

Of the studies reviewed, no research examined risk factors related to the social environment.

DISCUSSION

Trends in the Canadian literature

Our review identified several general trends in the published and grey literature on MVCs among Canadian Aboriginal people.

Rates of death, hospital admission and injury related to MVCs are at least double among Aboriginal than non-Aboriginal populations, both nationally and across most of the provinces. In terms of human factors, death and injury rates are generally higher among Aboriginal males than Aboriginal females, and individuals aged 65 and older do not appear to be at increased risk for MVCs. Use of substances (including alcohol and prescription or illicit drugs), not using seat belts and restraints, inattentiveness, inexperience, fatigue and speeding are relevant risk factors. In terms of vehicle and equipment factors, driving in a vehicle older than 1990 and driving a car (v. another type of vehicle) is more frequently associated with on-reserve than off-reserve MVCs. In terms of physical environment factors, MVCs occur more frequently in the territories than the provinces, and on on-reserve roads than off-reserve roads. Moreover, on-reserve MVCs are more likely to occur during the day and at intersections with local streets, and are more likely to involve road surfaces with packed snow, loose gravel or mud, and domestic animal interaction than off-reserve MVCs. None of the research reviewed examined how social environment may be associated with MVCs among Canadian Aboriginal people.

Many of these trends are supported in the international research. Aboriginal males, as well as males in the general public, tend to be at higher risk for MVCs than females.[9] Moreover, it appears that Aboriginal and non-Aboriginal people older than 65 years of age are not at heightened risk for MVC-related injury.[34,35] Poor road conditions, living in a rural area, speeding and the influence of alcohol consistently emerge as major risk factors for MVCs among Aboriginal people.[2,35] However, there appears to be a general lack of research worldwide examining social factors in relation to MVCs among Aboriginal people.

Current gaps and future research

From this review, it is apparent that gaps exist within the Canadian literature on MVC-related injury among Aboriginal people. Few studies employed an injury framework, such as the Haddon matrix,[7] to help address why Canadian Aboriginal people are at risk for MVCs and how to prevent injuries. Of the 20 articles reviewed, only 5 examined risk factors other than age and sex. Additionally, of the studies reviewed, no research examined the risk factors for MVCs related to the social environment. The Michon model[36] emphasizes the importance of the social environment. A driver's beliefs and personality can be linked to 3 levels of driving, decision-making and task performance: strategic level (i.e., decisions regarding the driving plan, such as choosing to not drive while impaired), tactical level (i.e., decisions relevant to the vehicle handling, such as choosing not to speed) and operational level (e.g., driving actions, such as braking). This model identifies a framework for examining the social environment related to MVCs.

It is important to consider that context and perspectives may not be consistent across different communities. For instance, whereas some populations may benefit from first employing educational interventions, a study conducted with an indigenous population in New Zealand indicated that individuals recognized the risks of impaired driving.[37] A collaborative approach is desirable and respectful when communicating with specific groups to conduct needs assessments, target specific risk factors and develop interventions that could potentially be effective for that group. Unfortunately, few culturally appropriated injury prevention and intervention programs exist in Canada.[38] Overall, understanding and incorporating the variations between different Aboriginal populations within Canada in regard to cultural differences, political policies and availability

of precrash- and crash-related risk factors (e.g., access to alcohol) should be a research priority.

We examined the grey literature in this review to help eliminate publication bias, and this was particularly useful in identifying trends across provinces. However, grey literature can often lack detail and methodological rigour compared with studies published in peer-reviewed journals. Some methodological issues are also pervasive throughout published research studies in this area.[2] Incomplete and inaccurate data are a major concern and likely underestimate the extent of the problem. Misclassification of ethnicity can occur, and culturally appropriate methods of collecting data are needed.[39] Moreover, improving surveillance efforts at a national and provincial level is important, because there is no current surveillance system for tracking injury patterns among Aboriginal people in Canada.[38]

A further consideration is that some studies compared ethnic groups, whereas others examined geographical regions. The use of ethnicity allows for examination of cultural or contextual factors specific to the group that may be missed when examining geographical regions; however, certain environmental factors (e.g., rural v. urban and on-reserve v. off-reserve differences) can only be identified when examining geographical regions. Future research may benefit from examining both the region and the ethnic group, which calls for precise classifications of study groups.

CONCLUSION

Unintentional injury and death caused by MVCs is an important, preventable issue among Canadian Aboriginal people and presents a major public health concern. Rates of MVC-related death, hospital admission and injury are twice as high among Aboriginal populations than the general Canadian population, and consistent trends in crash-related risk factors are apparent across Canada. These findings not only demonstrate an important issue in Aboriginal health and safety, but also clarify specific research priorities. Although national and provincial research exists, more rigorous research methods and studies examining the social environment would further advance our understanding of this problem. A framework for conducting MVC research involving Aboriginal populations could potentially aid in eliminating some of the methodological challenges faced by previous researchers and help in the development of effective programs and policy for prevention.

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Country cardiograms case 48

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This article has been peer reviewed.

A 50-year-old man with excruciating chest pain is brought to the emergency department in a remote Canadian community. Figure 1 shows the initial electrocardiogram (ECG). The initial troponin level is normal (< 0.03 μg/L). Acute anterior ST elevation myocardial infarction is diagnosed, and thrombolytic therapy is provided with tenecteplase.

About 45 minutes later, the monitor screen indicates that the rhythm has changed to a regular wide complex tachycardia at a rate of 105 beats/min, with no P waves apparent. While preparations are being made to record this rhythm on the ECG, sinus rhythm redevelops, and the ECG shown in Figure 2 is obtained.

What has happened, and what needs to be done?

For the answer, see page 109.

Competing interests: None declared.

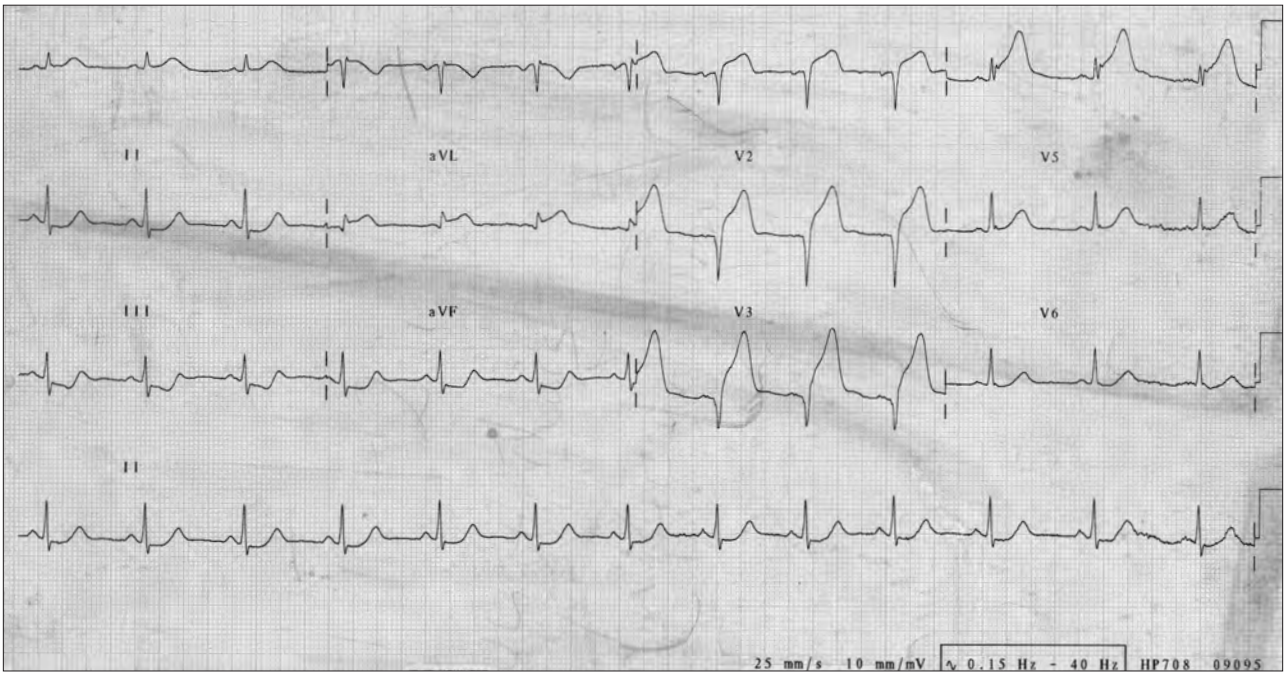

Fig. 1. Initial electrocardiogram of a 50-year-old man with excruciating chest pain.

"Country cardiograms" is a regular feature of *CJRM*. We present an electrocardiogram and discuss the case in a rural context. Please submit cases to Suzanne Kingsmill, *CJRM*, 45 Overlea Blvd., P.O. Box 22015, Toronto ON M4H 1N9; cjrm@cjrm.net.

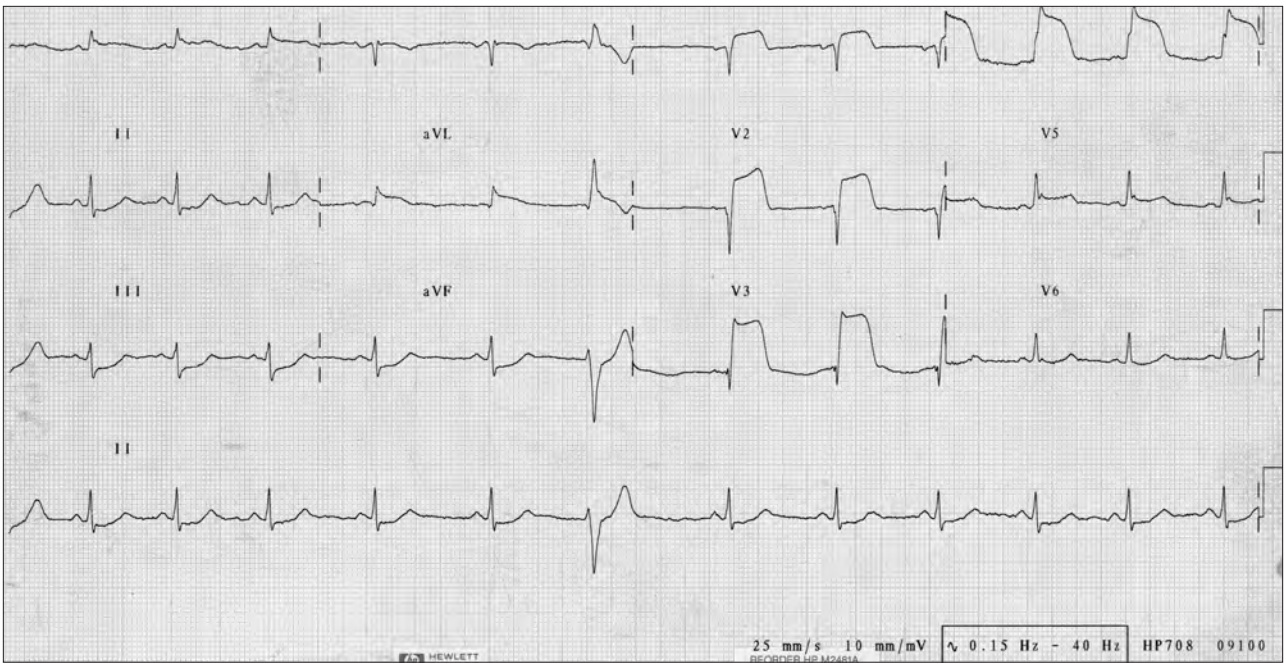

Fig. 2. Electrocardiogram recorded 45 minutes after administration of thrombolytic therapy.

Call for papers

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

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

Material in the following categories will be considered for publication.

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

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The occasional femoral line

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This article has been peer reviewed.

Femoral vein catheters are used in the rural setting to gain rapid intravenous access during trauma and cardiopulmonary resuscitation. The advantages of using the femoral vein are its large diameter and noninterference with cardiac compressions or intubation.[1] Additionally, there are no risks of pneumothorax with catheter insertion into a femoral vein, and it is easily compressed if bleeding occurs.[2] This article outlines the steps required to gain central venous access via the femoral vein.

INDICATIONS

- Obtaining vascular access quickly and efficiently when peripheral veins are inaccessible.[3]
- Infusing fluids or blood products in critically ill patients.[3]
- Administering potent vasoactive drugs, such as norepinephrine and dopamine, as well as solutions that are irritating or hypertonic, such as potassium chloride.[3]
- Measuring central venous pressure (e.g., during sepsis, congestive heart failure or pericardial effusion).
- Performing acute and subacute hemodialysis, as well as hemofiltration and cardiac pacing.[3]
- Administering nutritional therapy (total parenteral nutrition).

CONTRAINDICATION

The only contraindication to this potentially life-saving procedure is refusal by a competent patient.

RELATIVE CONTRAINDICATIONS

- Femoral vein catheters should not be used if a safer option exists.
- Sites with anatomic distortion, cutaneous burns, proximal vascular injury (e.g., thrombus) and infection should be avoided when inserting the femoral catheter, because complications are more likely to occur.
- Patients with coagulopathies are at higher risk of hemorrhage.[4]
- Do not use the femoral vein as a site for central venous access in cases of penetrating abdominal trauma or known vena cava disruption.

COMPLICATIONS

One study reports that more than 15% of patients who undergo venous catheterization for central venous access experience complications.[1] The most common complications include arterial puncture, infection, thrombosis and hematoma. Femoral vein catheters are associated with a higher thrombosis rate than all other central venous access sites.[1] Despite the femoral line's reputation as a "dirty" site, a recent study has shown no difference between catheter-insertion sites in the rate of catheter-related bloodstream infections.[5] Femoral vein catheterization is recommended for short-term use, and femoral venous lines should be removed when no longer needed to avoid complications.[2]

THEORY

The femoral vein travels in the femoral

sheath with the femoral artery, nerve and lymphatics. Anatomically, the femoral vein lies behind the inguinal ligament, about 1 cm below it, and just medial to the femoral artery. It is located very close to the skin and is easily accessible.[6]

EQUIPMENT

- Sterile personal protective gear (e.g., gloves, gown and mask)
- Sterile drape and towels
- Sterile preparation solution (e.g., chlorhexidine)
- Three 10-mL syringes containing sterile normal saline flush
- 3 intravenous caps
- Ultrasound machine (if available)
- Sterile sheath for ultrasound probe
- Coupling gel for ultrasound probe
- Central venous catheter set containing
  - 1% lidocaine, small-gauge needle and 10-mL syringe
  - 18-gauge introducer needle
  - Guidewire
  - #11-blade scalpel
  - Venodilator
  - Single- or multilumen catheter
  - Gauze pads measuring 4" × 4"
  - 3–0 or 4–0 silk suture with straight needle or needle driver
  - Sterile transparent dressing

ULTRASOUND GUIDANCE

If available, ultrasound guidance is highly recommended during central venous catheterization. As reported by Rothschild[7] and by Cheung and colleagues,[8] ultrasound guidance of central lines improves success rates for catheter insertion. Ultrasound guidance also reduces the number of venipuncture attempts before successful line insertion, and reduces the risk of complications.[7,8]

CONSENT

Before attempting the procedure, explain it to the patient and discuss possible complications. Obtain consent after ensuring the patient understands the risks and benefits of femoral vein catheterization. In an emergency situation, consent is implied.

THE PROCEDURE

1. The insertion of a femoral catheter should be performed under sterile conditions. Ensure that you are gowned and gloved, and wearing a facial mask and hair cover before beginning. After

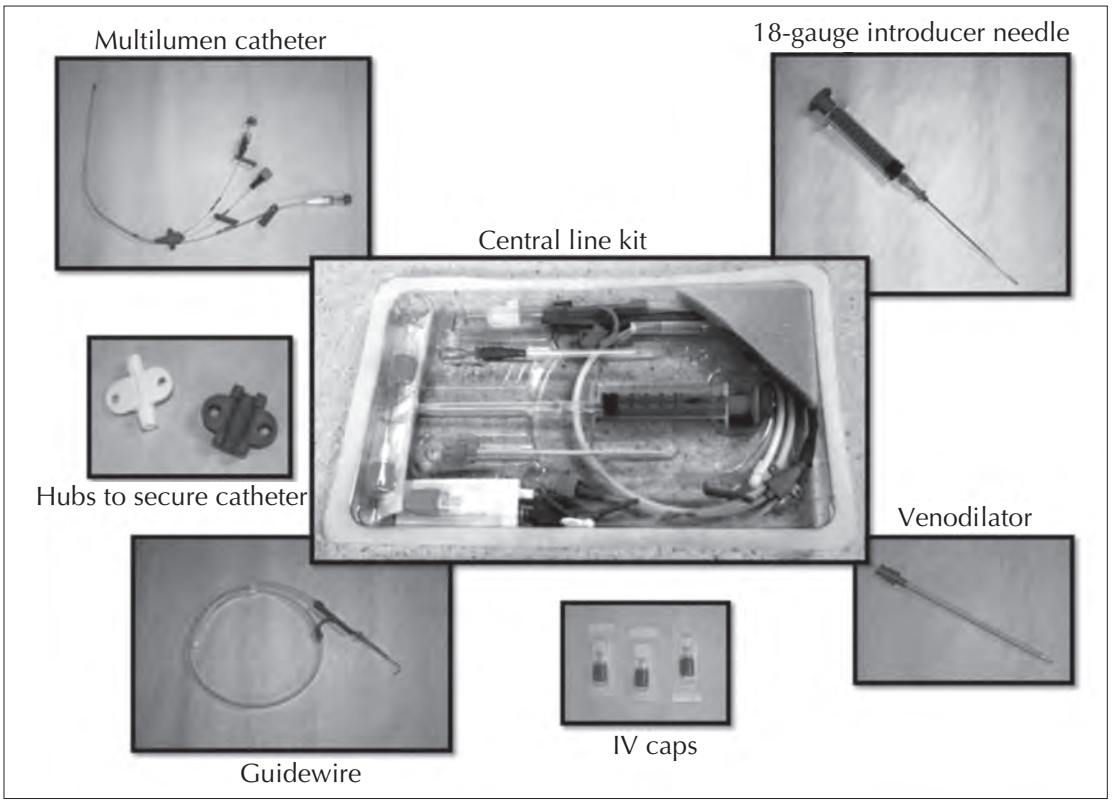

Fig. 1. A standard central venous catheter kit by Arrow Medical Products. IV = intravenous.

donning protective gear, open the standard kit (Fig. 1).

2. Expose the patient's femoral region by externally rotating and abducting the patient's leg away from the midline. Clean the groin area with disinfectant (chlorhexidine) 3 times with 3 different sterile sponges. Place a large sterile sheet on the patient's upper body and legs to create a sterile field. Palpate for the femoral artery to anatomically locate the femoral vein, which will be medial to the femoral artery. Inject 1–2 mL of 1% lidocaine subcutaneously using the small (25-gauge) needle to freeze the skin.
3. If bedside ultrasonography is available, use a linear probe to localize the femoral vein (Fig. 2). Orient the probe so that the patient's right side is on the right of the ultrasound monitor. If possible, place the probe in a sterile sheath with coupling gel inside. The femoral vein is collapsible, whereas the artery is not. Position the vein in the centre of the ultrasound monitor (Fig. 3).
4. Insert the 18-gauge introducer needle at a 30-degree angle from the skin while pulling back on the plunger of the syringe (Fig. 4). Confirm that the needle is in an appropriate position, with the help of the ultrasound images. Ultrasonography, venous manometry, pressure-waveform analysis or venous blood gas measurement can be used to confirm placement of the catheter. Once you observe a return of blood in the syringe, manually anchor the needle to avoid dislodging it. The blood seen in the syringe should be dark and nonpulsatile.
5. Detach the syringe and thread the guidewire through the needle (Fig. 5). The guidewire comes wrapped in a circular tube and has a plastic adaptor that feeds it into your needle. The guidewire has a folded tip that prevents it from lacerating the vein. It should pass smoothly and without resistance into the femoral vein. If you feel resistance, stop and evaluate the source. Once the guidewire is in the femoral vein, grasp

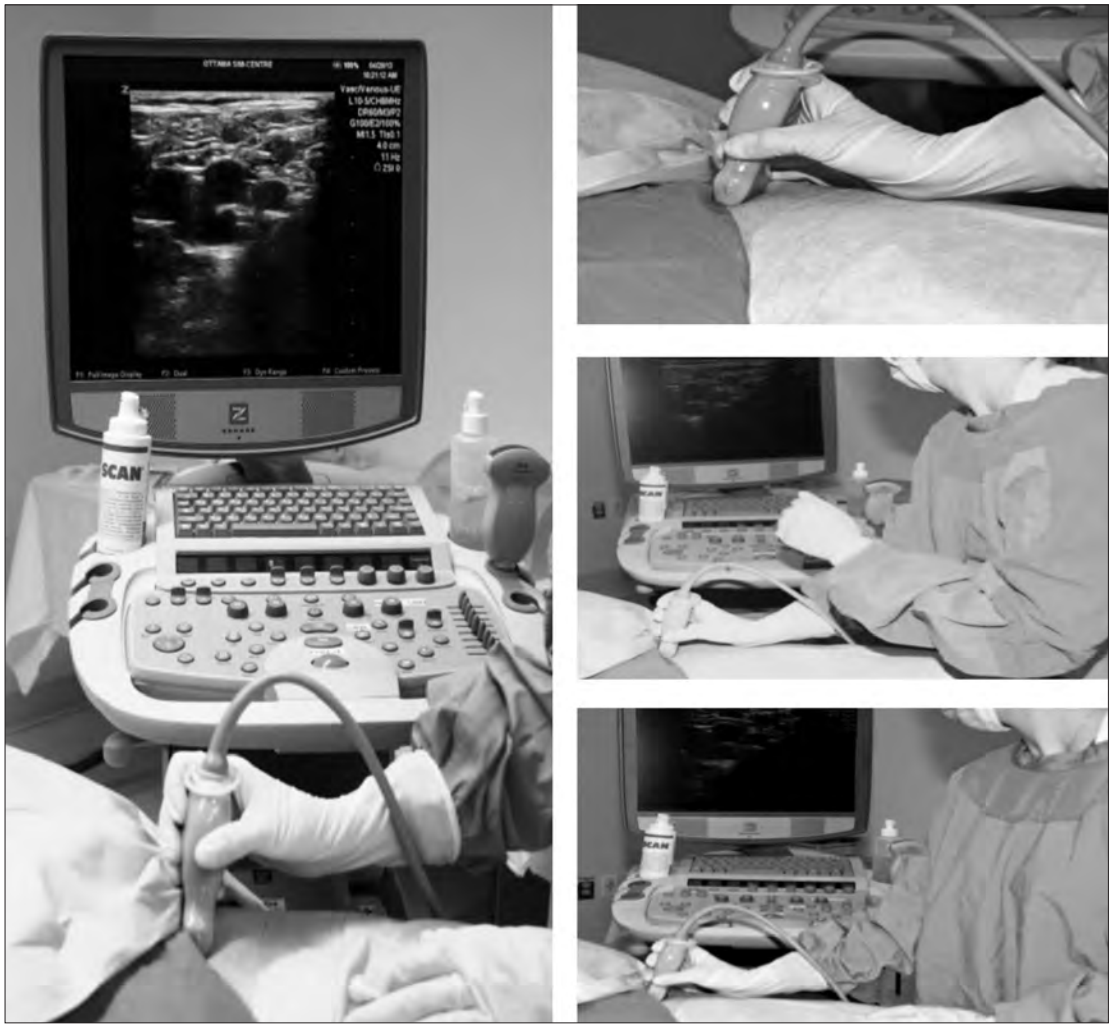

Fig. 2. Localization of the femoral vein using ultrasonography.

the guidewire firmly and remove the introducer needle (Fig. 6). Secure the guidewire to ensure it does not get lost inside the body (Fig. 7).

6. Pass the venodilator over the guidewire. At the skin, use the scalpel to make a small (0.5 cm) incision at the wire-entry site while maintaining a hold of your guidewire. Next, advance the venodilator over the wire to create a tract for the catheter.
7. Remove the venodilator from the femoral vein while continuing to hold on to the guidewire. Next, place the multilumen catheter on the guidewire and advance it into the femoral vein (Fig. 8). The guidewire will be pushed out of the port of the multilumen catheter. Remove the guidewire. Once the guidewire is removed, blood will flow up from the lumen of the catheter. The flow of blood will clear the air from the line. You can now attach the intravenous cap to a 10-mL syringe and flush normal

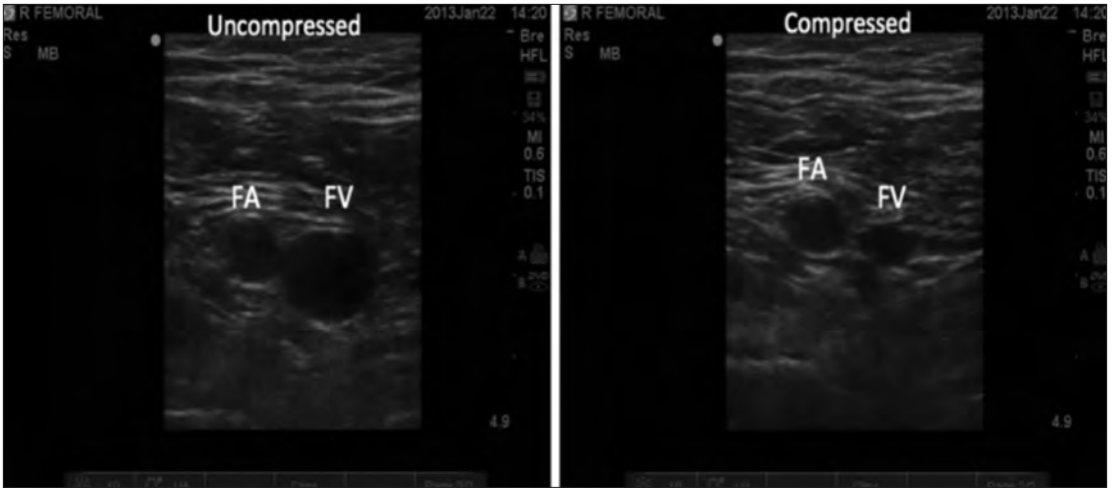

Fig. 3. Ultrasound images of the femoral vein (FV) and femoral artery (FA). The image on the left shows the femoral vein uncompressed, and the image on the right shows the femoral vein being compressed by the ultrasound probe. Images courtesy of A. Smith and B. Metcalfe at Memorial University.

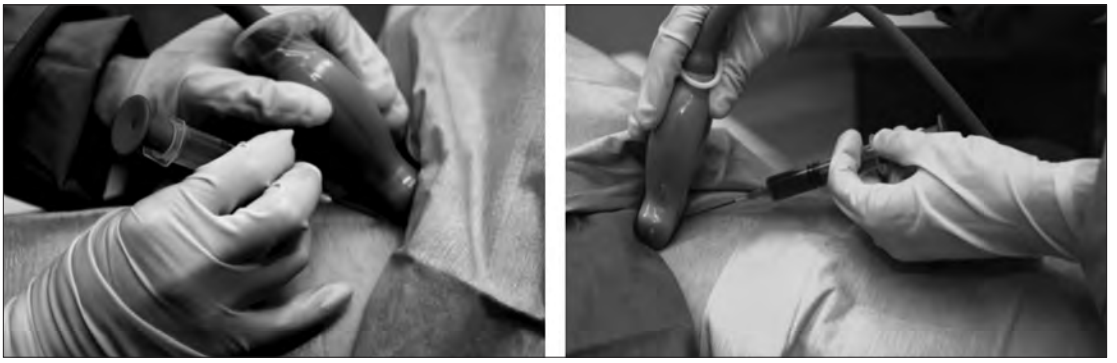

Fig. 4. Insertion of the introducer needle with ultrasound guidance.

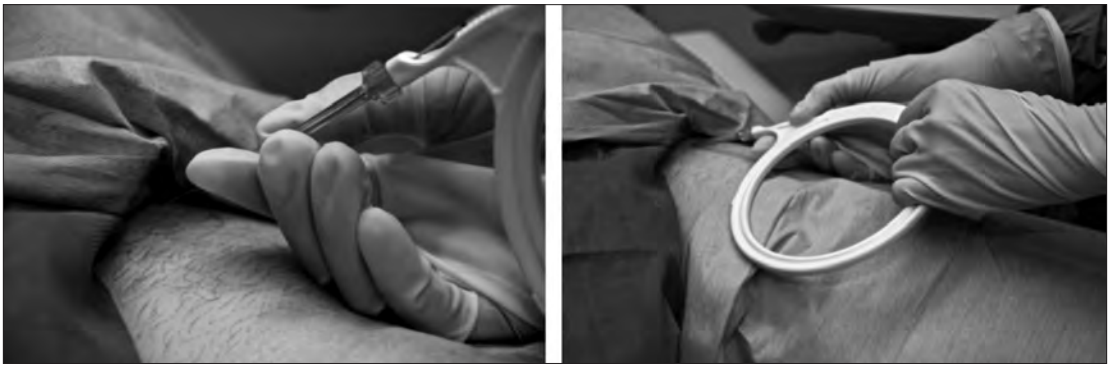

Fig. 5. Feeding of the guidewire through the introducer needle.

saline through the cap. Do the same for the other lumens of the catheter: bleed them back, attach the intravenous cap and then flush.

8. Secure the catheter by placing sutures through the hub openings on each side of the catheter (Fig. 9).

AFTER FEMORAL LINE INSERTION

After completion of the procedure, confirm venous placement of the wire before use of the line. Also confirm the final position of the catheter tip, which should lie in the inferior vena cava below the renal veins and above the confluence of the iliac veins. This last step can be done with abdominal radiography, fluoroscopy or continuous electrocardiography. However, radiography would be the likely method of choice in a rural location.[9]

CONCLUSION

The femoral vein provides a reliable site for central venous access and is relatively easy to catheterize. It is an advantageous site because it does not cause lung collapse or carotid punctures during insertion. Good aseptic technique and ultrasonographic assistance have led to successful femoral line insertions

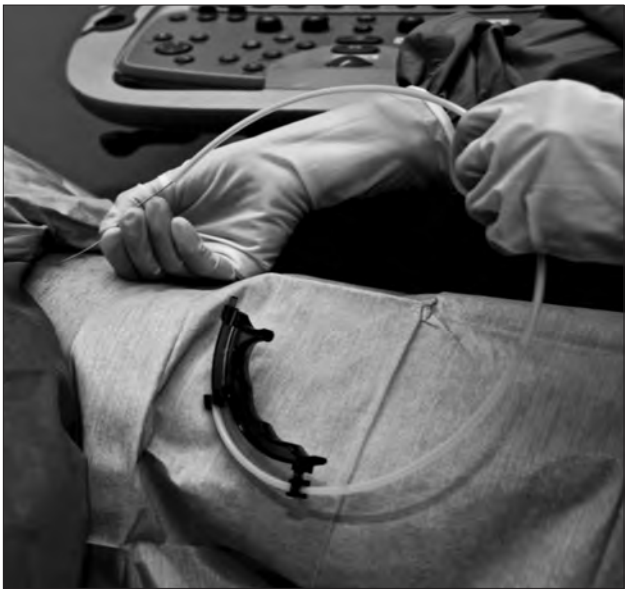

Fig. 6. Feeding of the guidewire into the femoral vein.

Fig. 7. Securing of the guidewire.

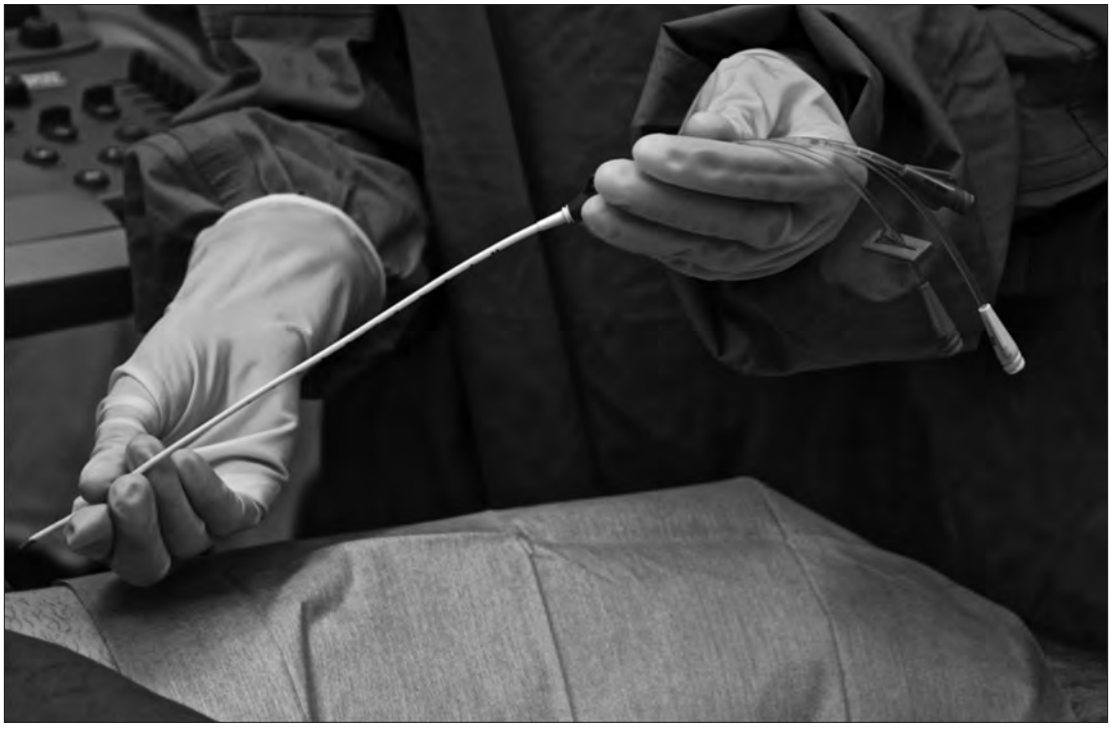

Fig. 8. Insertion of the multilumen catheter.

Fig. 9. Securing of the catheter.

and minimal complications.[4] Remember to remove central venous catheters as soon as possible to avoid complications and to reassess daily the need for keeping the catheter in place.[2]

PROCEDURE SUMMARY

1. Sterile preparation and equipment set-up
2. Positioning of the patient and locating of the femoral vein
3. Anesthesia
4. Location of the vein with ultrasonography
5. Placement of the introducer needle in the vein
6. Assessment of catheter placement with ultrasonography
7. Insertion of the guidewire
8. Removal of the introducer needle
9. Skin incision
10. Insertion of the venodilator and catheter
11. Removal of the dilator and guidewire
12. Flushing and capping of the lumens
13. Securing of the catheter
14. Confirmation of catheter tip position before use of the central line

Acknowledgements: The authors thank Andrew Smith and Brian Metcalfe at Memorial University for providing the ultrasound images of the femoral vein and artery. We also thank James Crispo for his help with the images in the paper. Lastly, we thank the University of Ottawa Skills and Simulation Centre for the use of their equipment to generate the images.

Competing interests: None declared.

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Move over Sir William Osler! The ascent of rural and remote medicine in Canada

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Sir William Osler (1849–1919), icon and father of academic medicine, was deemed one of the most renowned physicians in the British Empire. Globally, his influence concerning the protocols of academic medicine was not only profound, but also vast, and is still felt today.

Osler taught at McGill University and was the first director of medicine at Johns Hopkins University School of Medicine. He went on to the University of Oxford in 1905, where he held a coveted royal professorship. Like all founders of a new academic discipline, Osler did work that reflected the values and attitudes of his time — for better or for worse.

Osler's presidential address to the Canadian Medical Association (CMA), "On the Growth of a Profession," was published in 1885. Addressing an all-male audience, Osler pronounced,

> In some parts of the Dominion we may study the profession in its simplest form; in the Northwest Territories for example, it has not advanced beyond the amoeba stage. The doctors there are so many unicellular creatures — masses of undifferentiated professional protoplasm, without organization or special functional activities.[1]

Speaking of his colleagues in the "older provinces" Osler declared,

> the professional units have combined for the general good into a sort of polypidom — the organized profession — a great advance on the amoeba stage; there are special organs of reproduction known as the medical schools, and there are signs of a nervous system — medical societies.[1]

How the world of medicine has changed in the last 128 years! Indeed, the Society of Rural Physicians of Canada's (SRPC's) conference in Victoria, BC, was a celebration of rural medicine in Canada. Osler would have been amazed, if not astounded. More than 200 workshops and lectures were convened in a most collegial and "co-educational" environment. Indeed, the rural physician amoeba of the northwestern frontier convoked stellar sessions, including general practice (GP) obstetrics, with streams for GP anesthesia, GP surgery, ultrasonography, emergency medicine and First Nations health. Practical and interactive workshops included internal medicine, mentoring and professionalism, wilderness medicine and other topics.

I expect Osler would have been genuinely surprised that the conference chair was Dr. Braam de Klerk, an Inuvik practitioner who hailed from another former colony. Osler would have been even more surprised, indeed astounded, to learn that the current president of the CMA is a female physician from Yellowknife, NWT — not an amoeba per se but rather an articulate, passionate, professional physician, Dr. Anna Reid.

Reid spoke about health equity and the social determinants of health, the social imperative for a patient-centred charter and the advocacy role of physicians to work with, and reach out to, patient groups. She chastised her audience with a reminder that the tuberculosis rates in Nunavut are similar to those in developing countries such as Nepal and that nearly 900 000 Canadians are using food banks on a regular basis. Reid's strategic vision for the

CMA provides priority to build relationships and social compacts with communities. This represents a new accountability and will bode well for the future of rural and remote medicine.

Another profound keynote speaker, Dr. Dennis Kendel from Saskatchewan, spoke critically about what is and isn't working well in academic medicine. He asserted that physicians have been stuck in the old model of academic medicine. Kendel spoke about lost leadership and the critical challenges physicians face as the burden of care shifts from acute to chronic care. According to Kendel, physicians aren't being trained to be team players. Physicians today are still caught in the medical paradigm of Osler's century, the guild era, in which they operate independent practices and are not sufficiently connected to partners in health care and communities. Kendel praised family medicine in rural Saskatchewan as "team based, community designed, and patient centred." Osler, himself the father of patient-centred care, would have enjoyed the talk.

Guest speaker Dr. Richard Murray, from Australia, spoke about the challenges of recruitment and the selection of physicians. According to Murray, medical education is a "blunt instrument," and selection/recruitment into medicine is only half the game. He warned that if you recruit the sons and daughters of the urban elite and train them only in tertiary care centres dominated by key specialties, you can expect a narrowing scope of practice.

The second day of the conference would have surprised, if not impressed, Osler. First, the keynote speaker, Dr. Darlene Kitty, from the University of Ottawa, is female and second, she is Aboriginal. I'm quite sure there were no First Nations, Inuit or Metis physicians in the Canadian medical schools of his day.

In describing the early medical schools, Osler wrote in 1883,

> ... as the outcome of an unfortunate contretemps at Kingston, a School of Medicine for Women was started in that city, and followed by the establishment of another for the same purpose in Toronto. Of this latest development, there cannot be a feeling of regret that our friends in these cities should have entered upon undertakings so needless in this country. It is useless manufacturing articles for which there is no market, and in Canada, the people have not yet reached the condition in which the lady doctor finds a suitable environment. ... We can but hope that at the expiration of the five years for which kind friends have guaranteed the expenses, the promoters of these institutions will be in a position to place their energies and funds at the disposal of the schools devoted to the sterner sex.[1]

Osler further added,

> Do not understand from these remarks that I am in any way hostile to the admission of women to our ranks; on the contrary, my sympathies are entirely with them in the attempt to work out the problem as to how far they can succeed in such an arduous profession as that of medicine.[1]

Kitty, director of the Aboriginal Program at the University of Ottawa's Faculty of Medicine, gave an inspirational, heartfelt talk. She discussed the Journey of Nishiyuu in March 2013 and the Idle No More movement, which were inspired by Attawapiskat Chief Theresa Spence. Kitty spoke of the thousands of Canadians, Aboriginal and non-Aboriginal, who supported the young walkers on their 1600-km trek from the northern-most Cree community in James Bay, Que., to Ottawa, Ont. She passionately described how community supporters set up food support, foot clinics and accommodation. The walk represented a truly significant moment in Canadian history.

The SRPC's 21st Annual Rural and Remote Medicine Course was simply outstanding.

Let me thank the conference organizers and speakers, as they have renewed my faith and confidence in the medical profession. Their principles and values show promise for the future of rural and remote medicine in Canada.

Competing interests: None declared.

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Country cardiograms case 48: Answer

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Figure 1 (on page 99) displays normal sinus rhythm, with a rate of 76 beats/min. PR interval, QRS duration and QT interval are normal. Abnormal Q waves are present in leads V1 through V3. Marked ST segment elevation is present in leads V1 through V4 and in lead aVL. Reciprocal ST segment depression is present in inferior leads II, III and aVF. Even without a previous electrocardiogram (ECG) for comparison, in this clinical setting, extensive acute anterior ST elevation myocardial infarction can be diagnosed with confidence.

The wide-complex tachycardia observed in this patient has the features of an accelerated idioventricular rhythm (AIVR). Figure 2 (on page 100) displays sinus arrhythmia with a mean rate of 72 beats/min, and a premature ventricular complex. The obvious interval change lies in the ST segments in leads V1 through V4, which now exhibit extreme elevation (as much as 10 mm in V3 and V4).

Accelerated idioventricular rhythm is frequently encountered in the postthrombolysis setting and is regarded as a reperfusion arrhythmia. Given that in this patient the exacerbation of ST segment elevation immediately followed the AIVR, could this likewise be considered a reperfusion phenomenon?

Continuous ST segment monitoring sometimes indicates a transient exacerbation of ST segments during or immediately following reperfusion, before resolution of the ST segment elevation. This may be picked up on a postthrombolysis ECG.

Alternatively, a profound rise in ST elevation postthrombolysis may be a more sinister occurrence — a marker of reperfusion injury, a sign that an extensive area of myocardium is involved or an indication that rescue percutaneous coronary intervention may be needed.

In summary, the development of AIVR postthrombolysis usually heralds reperfusion. Cautious optimism combined with a continuous appraisal of rhythm, in case more malignant arrhythmias develop, is appropriate. Something similar could be applied to the development of extreme ST segment elevation as demonstrated in this example: it probably indicates reperfusion, and that things sometimes seem to get worse just before they get better. However, remember the potential concerns about large areas of myocardium being involved and the possible need for further intervention. In other words, stay the course, stay at the bedside and consider referral.

In this case, although ST segment elevation partially resolved soon after the ECG shown in Figure 2 was recorded, the patient was referred to a tertiary centre, where he underwent coronary angiography and the insertion of 3 stents. Markedly elevated troponin levels developed, peaking at above 90 μg/L.

For the question, see page 99.

Competing interests: None declared.

ZOSTAVAX®

[zoster vaccine live, attenuated (Oka/Merck)]

Prescribing Summary

Patient Selection Criteria

THERAPEUTIC CLASSIFICATION

Live, attenuated virus varicella-zoster vaccine

INDICATIONS AND CLINICAL USE

ZOSTAVAX® is indicated for the prevention of herpes zoster (shingles).

ZOSTAVAX® is indicated for immunization of individuals 50 years of age or older.

SPECIAL POPULATIONS

For use in special populations, see Supplemental Product Information, WARNINGS AND PRECAUTIONS, Special Populations.

CONTRAINDICATIONS

History of hypersensitivity to any component of the vaccine, including gelatin. History of anaphylactic/anaphylactoid reaction to neomycin (each dose of reconstituted vaccine contains trace quantities of neomycin). Neomycin allergy generally manifests as a contact dermatitis. However, a history of contact dermatitis due to neomycin is not a contraindication to receiving live virus vaccines.

Primary and acquired immunodeficiency states due to conditions such as: acute and chronic leukemias; lymphoma; other conditions affecting the bone marrow or lymphatic system; immunosuppression due to HIV/AIDS; cellular immune deficiencies. Immunosuppressive therapy (including high-dose corticosteroids); however, ZOSTAVAX® is not contraindicated for use in individuals who are receiving topical/inhaled corticosteroids or low-dose systemic corticosteroids or in patients who are receiving corticosteroids as replacement therapy, e.g., for adrenal insufficiency.

Active untreated tuberculosis.

Pregnancy (see WARNINGS AND PRECAUTIONS - Pregnant Women in the Supplemental Product Information).

Safety Information

WARNINGS AND PRECAUTIONS

General

The health care provider should question the patient about reactions to a previous dose of any varicella-zoster virus (VZV)-containing vaccines (see CONTRAINDICATIONS).

As with any vaccine, adequate treatment provisions, including epinephrine injection (1:1000), should be available for immediate use should an anaphylactic/anaphylactoid reaction occur. Deferral of vaccination should be considered in the presence of fever >38.5°C (>101.3°F). ZOSTAVAX® does not protect all individuals against the development of Herpes Zoster or its sequelae. See ACTION AND CLINICAL PHARMACOLOGY and CLINICAL TRIALS in the product monograph.

The duration of protection beyond 4 years after vaccination with ZOSTAVAX® is unknown. The need for revaccination has not been defined.

ZOSTAVAX® has not been studied in individuals who have previously experienced an episode of herpes zoster.

Transmission

In clinical trials with ZOSTAVAX®, transmission of the vaccine virus has not been reported. However, post-marketing experience with varicella vaccines suggests that transmission of vaccine virus may occur rarely between vaccinees who develop a varicella-like rash and susceptible contacts. Transmission of vaccine virus from varicella vaccine recipients who do not develop a varicella-like rash has also been reported and is therefore a theoretical risk for vaccination with ZOSTAVAX®. The risk of transmitting the attenuated vaccine virus to a susceptible individual should be weighted against the risk of developing natural herpes zoster and potentially transmitting wild-type VZV to a susceptible contact.

ADVERSE REACTIONS

Adverse Drug Reaction Overview

In clinical trials, ZOSTAVAX® has been evaluated for general safety in more than 32,000 adults 50 years of age or older. ZOSTAVAX® was generally well tolerated.

ZOSTAVAX® Efficacy and Safety Trial (ZEST) in Subjects 50 to 59 Years of Age

In the ZEST study, subjects received a single dose of either ZOSTAVAX® (n=11,184) or placebo (n=11,212) and were monitored for general safety throughout the study. During the study, a vaccine-related serious adverse experience was reported for 1 subject vaccinated with ZOSTAVAX® (anaphylactic reaction).

All subjects received a vaccination report card (VRC) to record adverse events occurring from Days 1 to 42 postvaccination in addition to undergoing routine safety monitoring throughout the study.

Vaccine-related injection-site and systemic adverse experiences reported at an incidence of ≥1% are shown in Table 1. The overall incidence of vaccine-related injection-site adverse experiences was significantly greater for subjects vaccinated with ZOSTAVAX® versus subjects who received placebo (63.9% for ZOSTAVAX® and 14.4% for placebo).

Table 1: Vaccine-Related Injection-Site and Systemic Adverse Experiences Reported in ≥1% of Adults Who Received ZOSTAVAX® or Placebo (1-42 Days Postvaccination) in the ZOSTAVAX® Efficacy and Safety Trial

Adverse Experience	ZOSTAVAX® (N = 11,094) %	Placebo (N = 11,116) %
Injection-Site		
Pain†	53.9	9.0
Erythema†	48.1	4.3
Swelling†	40.4	2.8
Pruritus	11.3	0.7
Warmth	3.7	0.2
Hematoma	1.6	1.6
Induration	1.1	0.0
Systemic		
Headache	9.4	8.2
Pain in extremity	1.3	0.8

† Designates a solicited adverse experience. Injection-site adverse experiences were solicited only from Days 1-5 postvaccination.

Within the 42-day postvaccination period in the ZEST, noninjection-site zoster-like rashes were reported by 34 subjects (19 for ZOSTAVAX® and 15 for placebo). Of 24 specimens that were adequate for Polymerase Chain Reaction (PCR) testing, wild-type VZV was detected in 10 (3 for ZOSTAVAX®, 7 for placebo) of these specimens. The Oka/Merck strain of VZV was not detected from any of these specimens.

Within the same 42-day postvaccination reporting period in the ZEST, varicella-like rashes were reported by 124 subjects (69 for ZOSTAVAX® and 55 for placebo). Of 23 specimens that were available and adequate for PCR testing, VZV was detected in one of these specimens from the group of subjects who received ZOSTAVAX®; however, the virus strain (wild type or Oka/Merck strain) could not be determined.

Shingles Prevention Study (SPS) in Subjects 60 Years of Age and Older

In the largest of these trials, the Shingles Prevention Study (SPS), 38,546 subjects received a single dose of either ZOSTAVAX® (n=19,270) or placebo (n=19,276) and were monitored for safety throughout the study. During the study, vaccine-related serious adverse experiences were reported for 2 subjects vaccinated with ZOSTAVAX® (asthma exacerbation and polymyalgia rheumatica) and 3 subjects who received placebo (Goodpasture's syndrome, anaphylactic reaction, and polymyalgia rheumatica).

In the Adverse Event Monitoring Substudy, a subgroup of individuals from the SPS (n=3,345 received ZOSTAVAX® and n=3,271 received placebo) were provided vaccination report cards to record adverse events occurring from Days 0 to 42 postvaccination in addition to undergoing routine safety monitoring throughout the study.

Table 2: Number of Subjects with ≥1 Serious Adverse Events (0-42 Days Postvaccination) in the Shingles Prevention Study

Cohort	ZOSTAVAX® n/N %	Placebo n/N %	Relative Risk (95% CI)
Overall Study Cohort			
All ages	255/18671 1.4%	254/18717 1.4%	1.01 (0.85, 1.20)
60-69 years old	113/10100 1.1%	101/10095 1.0%	1.12 (0.86, 1.46)
≥70 years old	142/8571 1.7%	153/8622 1.8%	0.93 (0.74, 1.17)
AE Monitoring Substudy Cohort			
All ages	64/3326 1.9%	41/3249 1.3%	1.53 (1.04, 2.25)
60-69 years old	22/1726 1.3%	18/1709 1.1%	1.21 (0.66, 2.23)
≥70 years old	42/1600 2.6%	23/1540 1.5%	1.76 (1.07, 2.89)

N=number of subjects in cohort with safety follow-up
n=number of subjects reporting an SAE 0-42 Days postvaccination

The incidence of death was similar in the groups receiving ZOSTAVAX® or placebo during the Days 0-42 postvaccination period: 14 deaths occurred in the group of subjects who received ZOSTAVAX® and 16 deaths occurred in the group of subjects who received placebo. The most common reported cause of death was cardiovascular disease (10 in the group of subjects who received ZOSTAVAX®, 8 in the group of subjects who received placebo). The overall incidence of death occurring at any time during the study was similar between vaccination groups: 793 deaths (4.1%) occurred in subjects who received ZOSTAVAX® and 795 deaths (4.1%) in subjects who received placebo.

Vaccine-related injection-site and systemic adverse experiences reported at an incidence ≥1% are shown in Table 3. Most of these adverse experiences were reported as mild in intensity. The overall incidence of vaccine-related injection-site adverse experiences was significantly greater for subjects vaccinated with ZOSTAVAX® versus subjects who received placebo (48% for ZOSTAVAX® and 17% for placebo).

Table 3: Vaccine-Related Injection-Site and Systemic Adverse Experiences Reported in ≥1% of Adults Who Received ZOSTAVAX® or Placebo (0-42 Days Postvaccination) in the Adverse Events Monitoring Substudy of the Shingles Prevention Study

Adverse Experience	ZOSTAVAX® (N = 3345) %	Placebo (N = 3271) %
Injection Site		
Erythema†	35.6	6.9
Pain/tenderness†	34.3	8.6
Swelling†	26.1	4.5
Hematoma	1.6	1.4
Pruritus	7.1	1.0
Warmth	1.7	0.3
Systemic		
Headache	1.4	0.9

† Designates a solicited adverse experience. Injection-site adverse experiences were solicited only from Days 0-4 postvaccination.

The remainder of subjects in the SPS received routine safety monitoring, but were not provided report cards. The types of events reported in these patients were generally similar to the subgroup of patients in the Adverse Event Monitoring Substudy. Within the 42-day postvaccination reporting period in the SPS, the number of reported noninjection-site zoster-like rashes among all subjects was small (17 for ZOSTAVAX®, 36 for placebo; p=0.009). Of these 53 zoster-like rashes, 41 had specimens that were available and adequate for PCR testing. Wild-type VZV was detected in 25 (5 for ZOSTAVAX®, 20 for placebo) of these specimens. The Oka/Merck strain of VZV was not detected from any of these specimens.

The number (n=59) of reported varicella-like rashes was also small. Of these varicella-like rashes, 10 had specimens that were available and adequate for PCR testing. VZV was not detected in any of these specimens. The results of virus testing in subjects with varicella-like and zoster-like rashes should be interpreted with caution due to the number of samples that were not available for testing.

The numbers of subjects with elevated temperature (≥38.3°C [≥101.0°F]) within 7 days postvaccination were similar in the ZOSTAVAX® and the placebo vaccination groups [6 (0.2%) vs. 8 (0.3%), respectively].

Other Studies

In other clinical trials conducted prior to the completion of the SPS, the reported rates of noninjection-site zoster-like and varicella-like rashes within 42 days postvaccination were also low in both zoster vaccine recipients and placebo recipients. Of 17 reported varicella-like rashes and non-injection site zoster-like rashes, 10 specimens were available and adequate for PCR testing, and 2 subjects had varicella (onset Day 8 and 17) confirmed to be Oka/Merck strain.

To address concerns for individuals with an unknown history of vaccination with ZOSTAVAX®, the safety and tolerability of a second dose of ZOSTAVAX® was evaluated. In a placebo-controlled, double-blind study, 98 adults 60 years of age or older received a second dose of ZOSTAVAX® 42 days following the initial dose; the vaccine was generally well tolerated. The frequency of vaccine-related adverse experiences after the second dose of ZOSTAVAX® was generally similar to that seen with the first dose.

Descriptive study P017 is an estimation study with no hypothesis testing. In this double-blind, placebo-controlled, randomized clinical trial, ZOSTAVAX® was administered to 206 subjects 60 years of age or older who were receiving chronic/maintenance systemic corticosteroid therapy at a daily dose equivalent of 5 to 20 mg of prednisone for at least 2 weeks prior to enrollment, and 6 weeks or more following vaccination to assess the immunogenicity and safety profile of ZOSTAVAX®. In this clinical trial, the safety profile was generally similar to that seen in the Adverse Event Monitoring Substudy of the SPS (see CONTRAINDICATIONS regarding corticosteroids).

Post-Marketing Adverse Drug Reactions

The following additional adverse reactions have been identified during post-marketing use of ZOSTAVAX®. Because these reactions are reported voluntarily from a population of uncertain size, it is generally not possible to reliably estimate their frequency or establish a causal relationship to the vaccine.

Gastrointestinal disorders: nausea.
Skin and subcutaneous tissue disorders: rash.
Musculoskeletal and connective tissue disorders: arthralgia; myalgia.
General disorders and administration site conditions: injection-site rash; injection-site urticaria; pyrexia; injection-site lymphadenopathy.
Immune system disorders: hypersensitivity reactions including anaphylactic reactions.

If a patient experiences an adverse event following immunization, please complete the appropriate Adverse Events following Immunization (AEFI) Form and send it to your local Health Unit in your province/territory.

To report a suspected adverse reaction, please contact Merck Canada Inc. in any of the following ways:

– Call toll-free 1-800-567-2594
– Complete a Canada Vigilance Reporting Form and fax toll-free to 1-800-369-3090
– Mail to: Merck Canada Inc., Pharmacovigilance, P.O. Box 1005, Pointe-Claire – Dorval, QC H9R 4P8

DRUG INTERACTIONS

Overview

ZOSTAVAX® must not be mixed with any other medicinal product in the same syringe. Other medicinal products must be given as separate injections and at different body sites.

Concurrent administration of ZOSTAVAX® and antiviral medications known to be effective against VZV has not been evaluated.

Use with Other Vaccines

ZOSTAVAX® and PNEUMOVAX® 23 (pneumococcal vaccine, polyvalent, MSD Std.) should not be given concomitantly because concomitant use resulted in reduced immunogenicity of ZOSTAVAX® (see CLINICAL TRIALS in the product monograph).

Administration

DOSAGE AND ADMINISTRATION
(see Product Monograph for complete information)
Recommended Dose and Dosage Adjustment

FOR SUBCUTANEOUS ADMINISTRATION.

Do not inject intravascularly.

Individuals should receive a single dose consisting of the entire content of the vial (approximately 0.65 mL).

ZOSTAVAX® is not a treatment for zoster or postherpetic neuraligia (PHN). If an individual develops herpes zoster despite vaccination, active current standard of care treatment for herpes zoster should be considered.

At present, the duration of protection after vaccination with ZOSTAVAX® is unknown. In the Shingles Prevention Study (SPS), protection was demonstrated through 4 years of follow-up. The need for revaccination has not yet been defined.

Reconstitute immediately upon removal from the freezer.

To reconstitute the vaccine, use only the diluent supplied, since it is free of preservatives or other antiviral substances which might inactivate the vaccine virus.

Vial of diluent

To reconstitute the vaccine, first withdraw the entire contents of the diluent vial into a syringe.

To avoid excessive foaming, slowly inject all of the diluent in the syringe into the vial of lyophilized vaccine and gently agitate to mix thoroughly. Withdraw the entire contents into a syringe, and using a new needle, inject the total volume of reconstituted vaccine subcutaneously, preferably into the upper arm - deltoid region.

IT IS RECOMMENDED THAT THE VACCINE BE ADMINISTERED IMMEDIATELY AFTER RECONSTITUTION, TO MINIMIZE LOSS OF POTENCY. DISCARD RECONSTITUTED VACCINE IF IT IS NOT USED WITHIN 30 MINUTES.

Do not freeze reconstituted vaccine.

CAUTION: A sterile syringe free of preservatives, antiseptics, and detergents should be used for each injection and/or reconstitution of ZOSTAVAX® because these substances may inactivate the vaccine virus.

It is important to use a separate sterile needle and syringe for each patient to prevent transfer of infectious agents from one individual to another.

Needles should be disposed of properly.

Parenteral drug products should be inspected visually for particulate matter and discoloration prior to administration, whenever solution and container permit. ZOSTAVAX® when reconstituted is a semi-hazy to translucent, off-white to pale yellow liquid.

OVERDOSAGE

There are no data with regard to overdose.

For management of a suspected drug overdose, contact your regional Poison Control Center.

STORAGE AND STABILITY

Storage

ZOSTAVAX® **SHOULD BE STORED FROZEN** at an average temperature of -15°C or colder until it is reconstituted for **injection** (see DOSAGE AND ADMINISTRATION). Any freezer, including frost-free, that has a separate sealed freezer door and reliably maintains an average temperature of -15°C or colder is acceptable for storing ZOSTAVAX®. The diluent should be stored separately at room temperature (20 to 25°C) or in the refrigerator (2 to 8°C). Do not store the diluent in a freezer.

Before reconstitution, protect from light.

DISCARD IF RECONSTITUTED VACCINE IS NOT USED WITHIN 30 MINUTES.

DO NOT FREEZE THE RECONSTITUTED VACCINE.

Supplemental Product Information

WARNINGS AND PRECAUTIONS

Special Populations

Geriatric: The mean age of subjects enrolled in the largest (N=38,546) clinical study of ZOSTAVAX® was 69 years (range 59-99 years). Of the 19,270 subjects who received ZOSTAVAX®, 10,378 were 60-69 years of age, 7,629 were 70-79 years of age, and 1,263 were 80 years of age or older. ZOSTAVAX® was demonstrated to be generally safe and effective in this population.

Pregnant Women: There are no studies in pregnant women. It is also not known whether ZOSTAVAX® can cause foetal harm when administered to a pregnant woman or can affect reproduction capacity. However naturally-occurring varicella-zoster virus infection is known to sometimes cause foetal harm. Therefore, ZOSTAVAX® should not be administered to pregnant women; furthermore, pregnancy should be avoided for three months following vaccination (see CONTRAINDICATIONS).

Nursing Women: It is not known whether VZV is secreted in human milk. Therefore, because some viruses are secreted in human milk, caution should be exercised if ZOSTAVAX® is administered to a nursing woman.

Pediatrics: ZOSTAVAX® is not recommended for use in this age group.

HIV-AIDS Patients: The safety and efficacy of ZOSTAVAX® have not been established in adults who are known to be infected with HIV with or without evidence of immunosuppression (see CONTRAINDICATIONS).

Immunocompromised Subjects: Data are not available regarding the use of ZOSTAVAX® in immunocompromised subjects (see CONTRAINDICATIONS).

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INTERIOR HEALTH OPPORTUNITIES

ANESTHESIOLOGIST: BC – Cranbrook. Permanent anesthesiologist desired for 74-bed regional facility, serving a catchment area of approximately 80,000 people. Shared responsibility of workload within Anesthesiology Department. The hospital has on-site CT, US and traveling MRI, and offers Internal Medicine, Obstetrics and Gynecology, General Surgery, Orthopedics, Ophthalmology, ENT, Pathology, Psychiatry and Radiology. Hours of work are negotiable and the compensation is fee-for-service so open for discussion. Multiple incentives: The Rural Physicians for British Columbia incentive provides a one-time incentive payment of $100,000 for a 3-year return of service; recruitment incentive $20,000; retention fee premium 14%; retention flat fee $12,240; relocation reimbursement. Cranbrook is surrounded by stunning scenery and boasts the most sunshine of anywhere in B.C. with unlimited summer and winter activities. For more information contact: email physicianrecruitment@interiorhealth.ca or view us online at our Web site www.betterhere.ca –RM-292

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

FAMILY PHYSICIAN: BC – Sparwood. The Sparwood Health Centre is looking for one full-time (1.0 FTE) physician and one half-time (0.5 FTE) physician for a full complement of three full-time (3.0 FTE) physicians. Physicians, in conjunction with other health professionals, collectively provide medical clinic services, emergency services (1-in-5), ambulatory care, laboratory, diagnostic imaging, public health, rehabilitation and primary care nursing. The new physician in Sparwood will provide ED services at the Sparwood Health Centre with those hours contributing towards contract hours and will participate in the MOCAP program. The emergency department in Sparwood is open daily from 8 am to 7 pm but closed at night. Great chronic disease prevention and management support with dietitian, diabetes educator, physiotherapist, etc. Practice in the heart of the Rockies – minutes from world-class skiing, mountain biking, snowmobiling and more. Sparwood (population 4200) is in the Kootenay Rockies just 20 minutes from Fernie and 2.5 hours from Calgary. Enjoy all the benefits of a small community while still having easy access to the big city. If interested please contact: email physicianrecruitment@interiorhealth.ca, or check out more information at our Web site www.betterhere.ca –RM-294

FAMILY PHYSICIAN: BC – Nakusp. Come and live the peaceful life that you have always wanted on the shores of the pristine Arrow Lakes and surrounded by a hiker's paradise. Nakusp offers a close community and rural environment that you only read about. This friendly village of 1,524 is perfect for people who want a slower pace of life. Hiking through great cedars on the weekend, lounging on the beach with your family, taking in the spa with your partner, or visiting the local hot springs by yourself, Nakusp offers something for everyone. Fee-for-service, approximately $300,000 per annum. Eligible for MOCAP funding plus numerous other rural incentives: The Rural Physicians for British Columbia incentive provides a one-time incentive payment of $100,000 for a 3-year return of service; recruitment incentive $20,000; retention fee premium 21.98%; retention flat fee $19,216.80; and relocation reimbursement. For more information contact: email physicianrecruitment@interiorhealth.ca or view us online at our Web site www.betterhere.ca –RM-279a

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

FAMILY PHYSICIAN: BC – Lillooet. Every fifth week you get a one week vacation! Further vacation negotiable! Excellent incentives and remuneration are only part of this opportunity. Wanted: family practitioner with ER skills to enjoy rural living and a magnificent wilderness playground. Lillooet is a rural town set against the beautiful backdrop of the Fraser River and spectacular B.C. Coastal Mountains. Located only 1.5 hours from Whistler, there are endless opportunities to enjoy fishing, canoeing, hiking, mountain biking, snowmobiling, ice-climbing, and skiing. Work with five other physicians in a single, unopposed practice. On call: 1-in-5. Fee-for-service. Numerous recruitment and retention incentives. For more information contact: email physicianrecruitment@interiorhealth.ca or view us online at our Web site www.betterhere.ca –RM-282

FAMILY PHYSICIAN: BC – Enderby. Interior Health is seeking a full-time physician to join a well-established clinic located in the beautiful North Okanagan. Collaborative practice in multidisciplinary setting that includes laboratory, mental health, public health and community care. Contract includes guaranteed income and no overhead; and Enderby qualifies for benefits under the Rural Incentive Program. Year-round recreation includes access to lakes in the summer and skiing in the winter. For more information contact: email physicianrecruitment@interiorhealth.ca or view us online at our Web site www.betterhere.ca –RM-284

FAMILY PHYSICIAN: BC – Princeton. The city of Princeton is seeking a permanent family physician for their vibrant, active community. The successful candidate will work with a team of physicians who provide a full range of medical services in a six-bed community hospital. Scope of practice includes joining on call for 24/7 emergency department. Princeton General Hospital provides emergency, general medicine, and basic laboratory and diagnostic imaging services. Hours are 9 am to 5 pm plus on call 1:4. With its friendly people and scenic location among rivers, mountains, and lakes, the area offers a wide range of year-round outdoor recreational opportunities. Multiple incentives: The Rural Physicians for British Columbia incentive provides a one-time incentive payment of $100,000 for a 3-year return of service; recruitment incentive $20,000; retention fee premium 16.07%; retention flat fee $14,045.40; and relocation reimbursement. For more information contact: email physicianrecruitment@interiorhealth.ca or view us online at our Web site www.betterhere.ca –RM-269a

FAMILY PHYSICIAN: BC – Elkford is located in the beautiful Elk Valley in the Rocky Mountains, close to Calgary. Recreational opportunities are limitless, including world-class mountain biking, fly fishing, and skiing at nearby Fernie Alpine Resort. Elkford seeks a full-time physician to fill a salaried, contract position in an EMR clinic with an integrated multidisciplinary team, laboratory and diagnostic imaging services, and ER (daytime only). Good regional specialist support. Generous signing bonus, relocation funding, rural retention bonuses, 43 paid vacation days per year, accommodation (6 months), and local recreation passes provided. For more information contact: email physicianrecruitmentinteriorhealth.ca or view us online at our Web site www.betterhere.ca. –RM-265b

INTERNIST: BC – Cranbrook. East Kootenay Regional Hospital (EKRH) invites candidates to join their team in providing consultative internal medicine. EKRH is centrally located near downtown Cranbrook, serving a catchment area of approximately 80,000 people. This position entails joining two other full-time Internists with special interests in rheumatology and nephrology and a third part-time General Internist. (A strong family practice department – many of whom are hospitalists. Internists generally do supportive care.) Qualifications are: Fellow of the Royal College of Physicians and Surgeons of Canada (FRCPC) and Advanced Cardiac Life Support Certification (ACLS) combined with internist experience. Hours of work: Monday through Friday, 9 am to 5 pm (excluding calls). On-call requirements are 1:4, MOCAP Level 1. Remuneration: fee for service – estimated gross income $350 - 450,000; rural incentives: recruitment incentive $20,000, retention fee premium 14%, retention flat fee $12,240, and relocation assistance. For more information contact: email physicianrecruitment@interiorhealth.ca or view us online at our Web site www.betterhere.ca –RM-290

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RM-297

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RM-299

GASHA

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Guysborough Antigonish Strait Health Authority serves a population of just under 44,000 residents in Antigonish, Guysborough, Inverness and Richmond counties in picturesque Nova Scotia.

Our District includes five healthcare facilities in Antigonish, Canso, Guysborough, Evanston and Sherbrooke. We also have services relating to Primary Health Care, Continuing Care, Addiction Services, Mental Health, and Public Health. GASHA is home to St. Francis Xavier University, a campus of the Nova Scotia Community College and has the first accredited District Trauma Centre in Nova Scotia.

Living and working in rural Nova Scotia comes with many benefits. Smaller communities mean closer relationships with fellow physicians, staff and local residents while still maintaining close proximity to the major centres within the Province.

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Contact:
Dr. Jeremy Hillyard, VP Medicine
Guysborough Antigonish Strait Health Authority
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IT IS ESTIMATED THAT NEARLY

1 IN 3

CANADIANS WILL EXPERIENCE HERPES ZOSTER IN THEIR LIFETIME, AND THE RISK INCREASES AFTER THE AGE OF 50.[1]

FOR SOME, IT CAN MEAN EXCRUCIATING AND POTENTIALLY DEBILITATING PAIN.[1,2,*]

SELECTED IMPORTANT SAFETY INFORMATION

ZOSTAVAX® is not a treatment for zoster or postherpetic neuralgia (PHN). If an individual develops herpes zoster despite vaccination, active current standard of care treatment for herpes zoster should be considered. Vaccination with ZOSTAVAX® may not result in protection of all vaccine recipients. ZOSTAVAX® is contraindicated in patients with a history of hypersensitivity to any component of the vaccine, including gelatin; a history of anaphylactic/anaphylactoid reaction to neomycin; primary and acquired immunodeficiency states due to conditions such as: acute and chronic leukemias; lymphoma; other conditions affecting the bone marrow or lymphatic system; immunosuppression due to HIV/AIDS, cellular immune deficiencies; immunosuppressive therapy (including high-dose corticosteroids); active untreated tuberculosis; pregnancy. In clinical trials, ZOSTAVAX® has been evaluated for general safety in more than 32,000 adults 50 years of age or older. ZOSTAVAX® was generally well tolerated. Vaccine-related injection-site and systemic adverse experiences reported at an incidence ≥1% are shown below. The overall incidence of vaccine-related injection-site adverse experiences was significantly greater for subjects vaccinated with ZOSTAVAX® versus subjects who received placebo (48% for ZOSTAVAX® and 17% for placebo among recipients aged ≥60 (Shingles Prevention Study [SPS]) and 63.9% for ZOSTAVAX® and 14.4% for placebo among recipients aged 50-59) (ZOSTAVAX® Efficacy and Safety Trial [ZEST]). Vaccine-related injection-site and systemic adverse experiences reported in ≥1% of adults who received ZOSTAVAX® (N=3,345) or placebo (N=3,271) (0-42 Days Postvaccination) in the Adverse Event Monitoring Substudy of the SPS were: erythema† (35.6%, 6.9%), pain/tenderness† (34.3%, 8.6%), swelling† (26.1%, 4.5%), hematoma (1.6%, 1.4%), pruritus (7.1%, 1.0%), warmth (1.7%, 0.3%), headache (1.4%, 0.9%). Most of these adverse experiences were reported as mild in intensity. The remainder of subjects in the SPS received routine safety monitoring, but were not provided report cards. The types of events reported in these patients were generally similar to the SPS subgroup of patients in the Adverse Event Monitoring Substudy. Vaccine-related injection-site and systemic adverse experiences reported in ≥1% of adults who received ZOSTAVAX® (N=11,094) or placebo (N=11,116) (1-42 Days Postvaccination) in the ZEST were: pain† (53.9%, 9.0%), erythema† (48.1%, 4.3%), swelling† (40.4%, 2.8%), pruritus (11.3%, 0.7%), warmth (3.7%, 0.2%), hematoma (1.6%, 1.6%), induration (1.1%, 0.0%), headache (9.4%, 8.2%), pain in extremity (1.3%, 0.8%).

* ZOSTAVAX® is not indicated to reduce the morbidity and complications associated with herpes zoster.

† Designates a solicited adverse experience. Injection-site adverse experiences were solicited only from Days 0-4 postvaccination in SPS and from Days 1-5 postvaccination in ZEST.

References: 1. Data on file, Merck Canada Inc. Product Monograph. ZOSTAVAX®, 2011. **2.** Clinical Manifestations: Chickenpox. In: Mandell G, Bennett J, Dolin R eds. Principles and Practice of Infectious Diseases, 6th ed, vol 2. Philadelphia: Elsevier; 2005.

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See prescribing summary on page 110