

Comparison of access to services in rural emergency departments in Quebec and British Columbia

Richard Fleet, MD, PhD*[†]; Louis-David Audette, MD*[†]; Jérémie Marcoux[†]; Julie Villa[†]; Patrick Archambault, MD, MSc*[†]; Julien Poitras, MD*[†]

ABSTRACT

Introduction: Although emergency departments (EDs) in Canada's rural areas serve approximately 20% of the population, a serious problem in access to health care services has emerged.

Objective: The objective of this project was to compare access to support services in rural EDs between British Columbia and Quebec.

Methods: Rural EDs were identified through the Canadian Healthcare Association's *Guide to Canadian Healthcare Facilities*. We selected hospitals with 24/7 ED physician coverage and hospitalization beds that were located in rural communities (using the rural and small town definition from Statistics Canada). Data were collected from ministries of health, local health authorities, and ED statistics. A telephone interview was administered to collect denominative user data statistics and determine the status of services.

Results: British Columbia has more rural EDs ($n = 34$) than Quebec ($n = 26$). EDs in Quebec have higher volumes (19,310 versus 7,793 annual visits). With respect to support services, 81% of Quebec rural EDs have a 24/7 on-call general surgeon compared to 12% for British Columbia. Nearly 75% of Quebec rural EDs have 24/7 access to computed tomography versus only 3% for British Columbia. Rural EDs in Quebec are also supported by a greater proportion of intensive care units (88% versus 15%); however, British Columbia appears to have more medevac aircraft/helicopters than Quebec.

Conclusions: The results suggest that major differences exist in access to support services in rural EDs in British Columbia and Quebec. A nationwide study is justified to address this issue of variability in rural and remote health service delivery and its impact on interfacility transfers and patient outcomes.

RÉSUMÉ

Introduction: Les services des urgences (SU) en milieu rural, au Canada, répondent aux besoins d'environ 20% de la

population, mais l'accès aux services de soins de santé connaîtrait un sérieux problème.

Objectif: Le projet visait à comparer l'accès aux services de soutien en milieu rural, entre le Québec et la Colombie-Britannique (C.-B.).

Méthode: Le *Guide des établissements de santé du Canada* de l'Association canadienne des soins de santé a servi à repérer les SU en milieu rural. Ont été sélectionnés les hôpitaux dotés d'un SU assurant une couverture médicale 24 h sur 27, 7 jours sur 7, et de lits pour malades hospitalisés, et situés dans des collectivités rurales (d'après les définitions de municipalité rurale et de petite ville de Statistique Canada). Il y a eu collecte de données dans les ministères de la Santé, auprès des autorités locales de la santé et à partir de statistiques sur les SU. Un entretien téléphonique a été réalisé afin de recueillir des statistiques descriptives sur les données des utilisateurs, et de déterminer l'offre de services.

Résultats: La C.-B. compte plus de SU en milieu rural ($n = 34$) que le Québec ($n = 26$). Par contre, les SU au Québec ont un volume plus important de consultations annuelles que la C.-B. (19 310 contre 7793). En ce qui concerne les services de soutien, 81% des SU en milieu rural au Québec ont un chirurgien général de garde, 24 h sur 24, 7 jours sur 7, comparativement à 12% en C.-B. Presque 75% des SU en milieu rural au Québec ont accès à la tomodensitométrie, 24 h sur 24, 7 jours sur 7, contre 3% seulement en C.-B. Les SU en milieu rural au Québec reçoivent également le soutien d'une plus grande proportion de services de soins intensifs (88% contre 15%) que la C.-B.; par contre, cette dernière province semble disposer de plus d'aéronefs ou d'hélicoptères d'évacuation sanitaire que le Québec.

Conclusions: D'après les résultats, il existerait des différences importantes entre le Québec et la C.-B. en ce qui concerne l'accès aux services de soutien, dans les SU en milieu rural. Il serait justifié de mener une étude pancanadienne afin d'examiner la question des différences d'offre de services de santé en région éloignée et en région rurale, et de

From the *Department of Family and Emergency Medicine, Université Laval, Quebec City, QC; †Research Chair in Emergency Medicine, Université Laval - Hôtel-Dieu de Lévis, Lévis City, QC.

Correspondence to: Dr. Richard Fleet, Research Centre, Hôtel-Dieu de Lévis, 143 Wolfe Street, Lévis, QC G6V 3Z1; rfleet@videotron.ca.

This article has been peer reviewed.

leur incidence sur les mutations des malades entre établissements et sur les résultats cliniques.

Roughly 20% of Canadians live rurally.¹ In general, rural citizens are older, have poorer health, and are at greater risk for trauma and fatal trauma than their nonrural counterparts.²⁻⁴ Despite the greater health care requirements of rural residents, they typically have fewer available resources and face more challenges accessing health care.⁵

Emergency departments (EDs) are safety nets for rural citizens as reflected by the significantly large proportion of all ED visits.^{6,7} There are important challenges in providing safe emergency care in rural Canada, including fewer hospitals, greater travel distances, and reduced access to specialized care, advanced imaging, intensive care units (ICUs), and trauma centres.⁸⁻¹⁰ The considerable distances between rural centres and these services and the limited means of emergency transportation all contribute to the challenges of providing timely definitive care.

Despite the Canadian Health Act's (CHA) requirement of "reasonable access" to health services,¹¹ media reports^{12,13} and case studies¹⁴ suggest a serious problem in access to health care services in rural areas. The survival of some rural hospitals is threatened by physician and nurse shortages; the survival of others is affected by budget cuts or efforts at regionalizing or centralizing care.^{2,15,16} The extent of these service alterations has not been documented.

Because health care is ultimately under provincial authority and without evidence-based national standards,¹⁰ we hypothesize that a significant nationwide variability in emergency care exists. The objective of this descriptive study was to compare access to support services in the rural EDs of British Columbia and Quebec as part of the initial phase of a nationwide research initiative.

METHODS

The protocol was submitted to our internal ethics review board (CHAU Hôtel-Dieu de Lévis) in July 2010. It was judged not to require further ethics evaluation in accordance with the Tri-Council Policy Statement as the research focused on the availability of services in public health care facilities and did not involve human subjects.

Keywords: computed tomography, emergency department, health services, rural critical care, rural emergency medicine, rural general surgery

Selection of rural EDs

We focused on rural EDs with 24/7 physician coverage located in hospitals with access to hospital beds for acute admissions. To facilitate eventual comparisons with EDs elsewhere, we excluded community health centres or clinics, nursing stations, mobile health units, or private facilities. Decision on the definition of "rural" used in this study was derived from Statistics Canada's definitions after consultation with professionals from its Division of Geography. We selected Statistics Canada's "rural and small town" (RST) definition: "the population living in towns and municipalities outside the commuting zone of larger urban centres (i.e., outside the commuting zone of centres with a population of 10,000 or more)."¹⁷ The criteria for RSTs are presented in Table 1.

EDs located in RST communities were then identified using the *Guide to Canadian Healthcare Facilities*.¹⁸ The hospitals' status was then confirmed with provincial health ministries by telephone or email. Furthermore, the list of RST where participating centres were located was also submitted to Statistics Canada for confirmation.

Data collection

As a first step, we sought to obtain data on ED patient volumes, local access to 24/7 consultant support, imaging services, access to ICU beds, transport capabilities, and distance to designated Level 1 and Level 2 trauma centres calculated with *Google Maps* (see

Table 1. Criteria for the RST definition from Statistics Canada

	RST criteria		
	Population		Population density/km ²
or	> 10,000	and	< 400
or	< 10,000	and	> 400
or	< 10,000	and	< 400

RST = rural and small town.

Hameed and colleagues⁹ for definition and identification of trauma centres). This Web-based mapping geographic information system provides valid estimations of road distances at low cost, has lower usability problems than other similar systems,¹⁹ and has been used previously in health care research.^{20,21}

Data were gathered from various sources, including government databases, official websites (e.g., provincial health ministries, British Columbia regional health authorities, British Columbia ambulance, and Quebec's *Direction nationale des urgences*), personal communication (e.g., Lizotte A, *Direction nationale des urgences, des services de traumatologie et des services préhospitaliers d'urgence, Ministère de la santé et des services sociaux du Québec*, 2013), and structured telephone interviews (Appendix).

A senior medical student (L.-D.A.) collected the data between July and September 2010 during a research rotation. A structured telephone interview protocol was developed and administered to an ED manager (see the Appendix). To standardize its delivery, the student practiced the interview with the principal investigator (R.F.), and several interviews were conducted under direct supervision.

Data entry and analysis

Two research assistants verified data entry. Descriptive statistics are presented as percentages, means, and standard deviations (SDs).

RESULTS

Feasibility of data collection

The study had a 100% participation rate. The estimated time to complete interviews was < 10 minutes. Most data were obtained by telephone interviews with local sites. For Quebec, the *Direction nationale des urgences* enabled us to verify ED patient volumes. Although information is available on computed tomographic (CT) scanners in Canada, data on 24/7 access in rural communities are limited. To the best of our knowledge, there are also no updated databases on access to consultant support and ICUs.

Identification of rural EDs and distances to trauma centres

Twenty-six EDs were identified in Quebec and 34 in British Columbia. Figure 1 and Figure 2 display the

locations of RST EDs, Level 1 and 2 trauma centres, and airbases for each province. Table 2 and Table 3 display the distance to the nearest Level 1 or 2 trauma centre and transport capabilities for each RST ED. Population and population-density statistics of the RST of EDs meeting the criteria are presented in Table 4. We could not provide reliable estimates of the hospital service area populations.

Access to support services and consultants

The results are presented in Table 5, Table 6, and Table 7. The vast majority of rural EDs have local access to basic laboratory and x-ray services on a 24/7 basis; however, there were important differences in terms of access to advanced imaging services, consultant support, and ICU care in favour of Quebec. ED patient volumes are greater than those of British Columbia.

DISCUSSION

This is the first study to describe and compare access to support services in rural EDs between these two provinces. In the absence of standardized national databases, the procedure used for identifying rural EDs and inquiring about current services appears to be a reasonable option in these small centres, where updated knowledge of the local particularities is likely. We found that the province of Quebec had fewer rural EDs than British Columbia and that these EDs displayed higher patient volumes. Whereas most rural EDs in Quebec have 24/7 access to a surgeon, a CT scanner, and ICUs, these services are only exceptionally available in British Columbia.

This study focused on key services as they have been found to be among the most important reasons for interfacility transfers and potential delays in timely care.²² We did not collect interfacility data in the context of this pilot study; however, patient transfers have a large impact on staff, medical resources, technological support, transfer systems, local and referral centre resources, patient costs, and safety.^{23,24} Unfortunately, little is known regarding this issue as it pertains to rural settings. One study, in 1997–1998 in the five hospitals in Huron County, Ontario (a rural region with a population of 60,220), found that about 2% of patients required interfacility transport.²² The main reasons for interfacility transfers were CT



Figure 1. Location of rural and small town emergency departments, Level 1 (red stars, A–C) and 2 (blue circles, D–H) trauma centres, and airbases (yellow squares, A, B). Trauma centres: A = Hôpital de l’Enfant-Jésus (CHU de Québec); B = Hôpital du Sacré-Cœur de Montréal; C = Montreal General Hospital; D = Hôpital de Chicoutimi; E = Centre Hospitalier Régional de Trois Rivières; F = Hôpital Fleurimont (CHU de Sherbrooke); G = Hôpital de Hull; H = Hôpital Charles-Lemoyne.

scanning, orthopedic care, and general surgical and critical care—hence the importance of examining accessibility to these services.

Access to a CT scanner

Although the provincial ratios of CT scanners per million people are similar (14.0 CT scanners in British Columbia versus 14.8 in Quebec for 2011),^{25,26} 97% of rural EDs in British Columbia do not have 24/7 local access to a CT scanner compared to 27% in Quebec. In 2011, among the 64 CT scanners available in British

Columbia’s hospitals, only 2 (3.1%) were located in rural hospitals. In Quebec, of the 118 known CT scanners, 19 (16.1%) were located in rural centres.²⁵ CT scanners are available in most community and academic hospitals. They are an essential diagnostic tool with an expanding role in the diagnosis and early triage of patients with acute and sometimes life-threatening illnesses, including stroke, major trauma, head injury, pulmonary embolism, abdominal pain, headache, renal colic, and chest pain. A recent study found that CT scanner use during ED visits increased 330%, from 3.2% of encounters (95% confidence interval [CI]



Figure 2. Location of rural and small town emergency departments, Level 1 (red star, A) and 2 (blue circles, B–E) trauma centres, and airbases (yellow squares, A, D–G) in British Columbia. Trauma centres: A = Vancouver General Hospital; B = Royal Columbian Hospital; C = Victoria General Hospital; D = Royal Inland Hospital; E = Kelowna General Hospital.

2.9–3.6) in 1996 to 13.9% (95% CI 12.8–14.9) in 2007.²⁶ If these estimations were to be applied to an average-sized rural ED in British Columbia, upwards of 1,000 patients would require interfacility transfers for CT scanning alone. No recent study has been conducted to establish CT scanner use in rural settings in Canada.

In 1999, the first small rural hospital in Canada to propose a CT scanner was in Walkerton, a town 160 km north of London (population of 5,036 at the time).⁸ The CT scanner was proposed in the context of a pilot study that was cut short because of positive outcomes. It improved perceived diagnostic certainty, wait times, and patient satisfaction. The authors concluded that the rural scanner changed the area's health care in significant ways and helped to narrow the gap between rural and urban service levels.

As medical technology becomes established, its natural progression is to move from tertiary to secondary institutions and, finally, to primary institutions, such as

rural hospitals. In theory, CT scanners should be following this pattern and access should increase nationwide. Yet provinces appear to implement technology at a different pace. Concerns regarding operational costs and radiation exposure may be barriers to CT implementation. A middle ground must be found as better access to CT scanners could improve timely patient care and reduce interfacility transport and admissions rates. This could help offset the costs of purchase and operation.

Access to surgical care

The remarkable difference in access to a local general surgeon (including a general practitioner surgeon) between Quebec and British Columbia is intriguing. In Quebec, rural hospitals without a general surgeon are the exception even in the lower-volume EDs. General surgical care support is often considered an essential emergency service. Although there are no published

Table 2. Distance to the nearest Level 1 or 2 trauma centre and transport capabilities in Quebec

Hospital number	Distance to the nearest Level 1 or 2 trauma centre by road (<i>Google Maps</i>)		Transport capability	
	Trauma centre	Distance (km)	Air (airplane)	Ground
1	Level 1	145		X
2	Level 1	418	X	X
3	Level 1	275		X
4	Level 2	104	X	X
5	Level 1	91		X
6	Level 1	141		X
7	Level 2	54		X
8	Level 2	98		X
9	Level 2	131		X
10	Level 2	75		X
11	Level 1	672	X	X
12	Level 2	468		X
13	Level 1	2,016*	X	
14	Level 2	156		X
15	Level 1	858		X
16	Level 2	361	X	X
17	Level 1	590*	X	
18	Level 1	498	X	X
19	Level 1	724*	X	
20	Level 1	701*	X	
21	Level 1	1,160*	X	
22	Level 1	81		X
23	Level 1	162		X
24	Level 1	221		X
25	Level 1	86		X
26	Level 1	59		X

*Air medevac only (*Google Maps* distances may not apply).

Canadian data, one recent study on rural hospitals in the United States reported that 87% had access to general surgical care.²⁷ Local access to general surgeons is important for providing care for common surgical emergencies (e.g., appendicitis), yet rural surgeons have vast skill sets and assist in other situations, such as the management of trauma and obstetric emergencies.^{28,29} A lack of surgical coverage is a major reason for interfacility transport.²² Given that most rural hospitals in Canada are outside the golden hour of trauma care⁹ and that rural citizens are at an increased risk for trauma and trauma death,²⁻⁴ future similar studies should examine the cost-effectiveness of providing local surgical care versus interfacility transfers.

Access to intensive care services

The lower proportion of ICUs in British Columbia versus Quebec is also of interest. Do different models

of providing critical care in rural areas explain this difference? Quebec has used a model of critical care delivery where the principal care providers are general practitioners with special interest and experience in critical care. In other provinces, like British Columbia, where internal medicine specialists principally staff ICUs, staffing challenges have been considerable and have led to lengthy periods of coverage gaps.¹² The transfer for critical care patients has in itself been implicated in contributing to poor outcomes.^{23,30}

Could the development of formalized training programs in critical care for general practitioners be a solution minimizing interfacility transfers and ICU coverage gaps in rural areas? A program akin to the College of Family Physicians of Canada training in emergency medicine (CCFP-EM) may be of interest. Finally, support for rural ICUs from consultants in academic centres using telemedicine may represent a hybrid model worth exploring.

Table 3. Distance to the nearest Level 1 or 2 trauma centre and transport capabilities in British Columbia

Hospital number	Distance to the nearest Level 1 or 2 trauma centre by road (<i>Google Maps</i>)		Transport capability	
	Trauma centre	Distance (km)	Air (airplane, helicopter)	Ground
1	Level 2	244	X	X
2	Level 1	996*	X	
3	Level 2	209	X	X
4	Level 2	892	X	X
5	Level 2	827		X
6	Level 2	—	X	X
7	Level 1	499**	X	
8	Level 2	127		X
9	Level 1	297**		X
10	Level 1	1,044*.**	X	
11	Level 2	134	X	X
12	Level 1	258**	X	X
13	Level 1	271**		X
14	Level 2	317	X	X
15	Level 2	347	X	X
16	Level 2	55	X	X
17	Level 2	748	X	X
18	Level 2	170	X	X
19	Level 2	709	X	X
20	Level 2	404		X
21	Level 2	84	X	X
22	Level 1	1,799*	X	
23	Level 2	491	X	X
24	Level 2	453	X	
25	Level 2	165	X	X
26	Level 1	1,700*	X	
27	Level 2	216	X	X
28	Level 1	656	X	X
29	Level 2	102	X	X
30	Level 2	621	X	X
31	Level 1	69	X	
32	Level 2	681	X	X
33	Level 2	311	X	X
34	Level 2	964	X	X

*Air medevac only (*Google Maps* distances may not apply).
**Refer to a trauma centre in Alberta.

Access to trauma centres and air medevac

This study also showed that 71% RST EDs in British Columbia and 42% in Quebec are more than 300 km from a Level 1 trauma centre and 68% in British Columbia and 46% in Quebec are more than 300 km from a Level 2 trauma centre (see Table 5). Although we focused on hospitals, our results are consistent with a recent report on access to trauma centres that showed that 22.5% of Canadians reside more than 1 hour by

road from a Level I or II trauma centre—mostly citizens living in rural and remote regions.⁹ Although clinical outcomes have been shown to be superior in these trauma centres,^{31,32} it is likely that a significant subset of trauma cases is initially managed in rural hospitals. Although British Columbia has more air medevac potential than Quebec, many factors affect timely air medevac other than the number of aircraft (weather, geography, trained and available staff, budget constraints, and maintenance issues). Future studies

Table 4. Emergency departments in Quebec and British Columbia

	Quebec	British Columbia
Population of province	7,905,100	4,529,500
Number of EDs	94	74
Population per ED	84,097	61,209
RST EDs, <i>n</i> (%)	26 (28)	34 (46)
Annual ED patient visits		
Mean (SD)	6,494 (3,853)	3,749 (2,586)
Range	1,263–14,819	293–9,640
Population density of RST (person/km ²) mean (SD)	107 (166)	230 (202)

ED = emergency department; RST = rural and small town.

should compare interfacility transfer processes and, ultimately, patient outcomes with respect to the availability of aircraft.

Given that timely interfacility transfer may not always be possible from rural hospitals, a potential for negative outcomes exists.³³ In one Canadian study, rural trauma patients arrived at a Level 1 trauma centre an average of 6 hours after presenting to a rural centre,³¹ and the risk of trauma death is threefold higher in rural than in urban settings. The study also showed that half of patients died before arrival at the hospital. The authors concluded that there is a potential value to interventions designed to enhance the skill set and resources of rural EDs.

Explanations for the differences in access between British Columbia and Quebec

It is possible that better access to services in Quebec simply reflects higher ED patient volumes. ED patient volumes, in turn, may be a reflection of Quebec's larger population (which is more than 1.75 times that of British Columbia) and a greater proportion of Quebec citizens living in rural areas (19.4% of Quebec residents live in rural areas in comparison with 13.9% in British Columbia).³⁴ Although we did not ascertain accessibility to RST EDs (that meet our inclusion criteria), it is likely that the fewer number of EDs in Quebec explains the higher patient volumes. Quebec

Table 5. Comparison of rural hospitals' general characteristics in Quebec and British Columbia

Characteristic	Quebec (<i>n</i> = 26)	British Columbia (<i>n</i> = 34)
Annual ED patient visits		
Mean (SD)	19,310 (6,141)	7,793 (4,825)
Range	4,300–32,775*	1,200–17,678
Number of stretchers		
Mean (SD)	7.23 (3.14)	5.71 (2.70)
Range	3–14	2–13
Local ICU, <i>n</i> (%)	23 (88)	5 (15)
EDs > 300 km from the nearest Level 1 trauma centre, <i>n</i> (%)	11 (42)	24 (71)
EDs > 300 km from the nearest Level 2 trauma centre, <i>n</i> (%)	12 (46)	23 (68)
Air medevac capability, <i>n</i> (%)	10 (38)	29 (85)
Number of medevac airplanes and helicopters, <i>n</i> (%)	4 airplanes 0 helicopter	6 airplanes 4 helicopter

ED = emergency department; ICU = intensive care unit.
*One ED presented 32,775 annual patient visits but met rural and small town criteria (population 11,353 and population density 90 persons/km²).

Table 6. Comparison of 24/7 access to consultants in rural EDs in Quebec and British Columbia

Consultant	Quebec (n = 26), n (%)	British Columbia (n = 34), n (%)
Anesthesiologist (including GP anesthesiologist)	20 (77)	3 (9)
General surgeon (including GP surgeon)	21 (81)	4 (12)
Internal medicine	10 (38)	4 (12)
Obstetrician-gynecologist	11 (42)	2 (6)
Orthopedist	6 (23)	1 (3)
Pediatrician	5 (19)	2 (6)
Respiratory technician	21 (81)	2 (6)

ED = emergency department; GP = general practitioner.

has more limited access to family physicians than British Columbia. In Quebec, 25.5% of citizens have no family doctor versus 13.9% in British Columbia,³⁵ and access to family physicians in rural areas of Quebec has been associated with increased ED use, especially for less acute illnesses.⁶ Future studies should consider access to primary care providers and patient acuity as potential explanations of ED consultations in rural Canada.

Service attribution in these two provinces may also reflect different provincial policies and priorities. Although the accessibility clause of the CHA appears to suggest that Canadians should have equitable access to care, provinces have primary jurisdiction in this area. British Columbia appears to favour better access to lesser-equipped EDs and more potential access to air transport than Quebec. In 2006, Quebec revised its *Emergency Department Management Guide*,³⁶ a guide with straightforward recommendations for the provision of emergency care that includes a section dedicated to rural EDs. For hospitals meeting our inclusion criteria, this guide specifies that local surgical, ICU, and CT scanner services should be locally available when an ED has more than 10,000 patient-stretcher visits per year. Whether the differences in access reflect the implementation strategies

associated with this updated guide awaits further study.³⁷

Limitations

Although this study suggests a difference in access to local consultant support, ICUs, and advanced imaging services, it was not designed to examine the impact on patient outcomes and need for interfacility transfers. This study focused on a selected category of rural EDs located in hospitals that provided 24/7 physician coverage with hospitalization beds. We did not examine access to first-line emergency care, such as dispensaries, first responders' stations, walk-in clinics, and non-24/7 locum consultant support. Reliable data on these services are even more challenging to obtain, yet access to these services may provide important basic emergency services that were not considered in this study. Level of service was determined mainly by responses to interview questions and open to interpretation. For example, the exact level of "ICU" care was not established. Finally, British Columbia and Quebec were selected for comparison in the initial planning stage of a nationwide study for reasons of convenience (the practice experience of coauthors R.F. and J.P.¹⁴) and similarity of size. They also have the

Table 7. Comparison of 24/7 access to equipment in rural EDs in Quebec and British Columbia

	Quebec (n = 26), n (%)	British Columbia (n = 34), n (%)
Bedside ultrasonography	22 (85)	26 (76)
CT scanner	19 (73)	1 (3)
Laboratory	26 (100%)	33 (97)
Magnetic resonance imaging	0	0
Simple radiography	26 (100)	33 (97)

CT = computed tomographic; ED = emergency department.

lowest health expenditure per capita, \$5,700 and \$5,469, respectively.³⁸ Other interprovincial disparities were not explored.

Strengths

Through brief telephone interviews, we obtained robust, current data directly from all 60 rural EDs of both provinces. Until provinces standardize databases on rural EDs and ensure that these are regularly updated, direct contact with individuals may be the only way to obtain similar information. As such, this is the first study to provide comparative data between provinces.

CONCLUSION

Our findings suggest that there is considerable variability between provinces with respect to access to health services in rural EDs. These results illustrate the need for a pan-Canadian study of emergency care in rural areas to examine access to quality emergency care and its impact on patient care and costs. It is mandatory that Canadians have access to high-quality emergency care regardless of where they live. It is also imperative that decisions on service attribution be evidence based.

Acknowledgements: We wish to thank Julie Maltais-Giguère, RD, MSc, and Sylvain Bussi eres, PhD, for their help in preparing the final version of the manuscript and Dr. France L egar e for her comments.

Competing interests: The research project was supported in part by a Junior 1 Clinician –Scientist award from the FRQS (RF), the Research Chair in Emergency Medicine Laval University – CHAU H otel-Dieu de L evis Hospital, and the H otel-Dieu de L evis Hospital research fund.

REFERENCES

1. Statistics Canada. *Canada's rural population since 1851*. 2011. Available at: http://www12.statcan.gc.ca/census-recensement/2011/as-sa/98-310-x/98-310-x2011003_2-eng.pdf (accessed January 7, 2013).
2. Canadian Institute for Health Information. *How healthy are rural Canadians? An assessment of their health status and health determinants*. 2006. Available at: <http://www.phac-aspc.gc.ca/publicat/rural06/> (accessed January 7, 2013).
3. Bell N, Simons RK, Lakha N, et al. Are we failing our rural communities? Motor vehicle injury in British Columbia, Canada, 2001-2007. *Injury* 2012;43:1888-91, doi:10.1016/j.injury.2011.07.018.
4. Simons RK, Brasher PMA, Taulu T, et al. A population-based analysis of injury-related deaths and access to trauma care in rural-remote northwest British Columbia. *J Trauma* 2010;69:11-9, doi:10.1097/TA.0b013e3181e17b39.
5. Hay D, Varga-Toth J, Hines E. *Frontline health care in Canada: innovations in delivering services to vulnerable populations*. Ottawa, Ontario: Canadian Policy Research Networks; 2006.
6. Haggerty JL, Roberge D, Pineault R, et al. Features of primary healthcare clinics associated with patients' utilization of emergency rooms: urban-rural differences. *Health Policy* 2007;3:72-85.
7. Thompson JM, McNair NL. Health care reform and emergency outpatient use of rural hospitals in Alberta, Canada. *J Emerg Med* 1995;13:415-21, doi:10.1016/0736-4679(95)00014-2.
8. Merkens BJ, Mowbray RD, Creeden L, et al. A rural CT scanner: evaluating the effect on local health care. *Can Assoc Radiol J* 2006;57:224-31.
9. Hameed SM, Schuurman N, Razek T, et al. Access to trauma systems in Canada. *J Trauma* 2010;69:1350-61, doi:10.1097/TA.0b013e3181e751f7.
10. Canadian Association of Emergency Physicians. *Recommendations for the management of rural, remote and isolated emergency health care facilities in Canada*. 1997. Available at: <http://caep.ca/resources/position-statements-and-guidelines/management-rural-remote-and-isolated-emergency-health-care> (accessed January 7, 2013).
11. Minister of Justice. *Canada Health Act*. 2012. Available at: <http://laws-lois.justice.gc.ca/eng/acts/C-6/> (accessed January 7, 2013).
12. Newman S. Nelson doctors issue emergency aid plea. *Globe and Mail* 2008 Oct 7; British Columbia section.
13. Howlett K. Teen's death ignites debate over emergency room closures. *Globe and Mail* 2010 Jan 22.
14. Fleet R, Plant J, Ness R, et al. Patient advocacy by rural emergency physicians after major services cuts: the case of Nelson, BC. *Can J Rural Med* 2013;18:56-61.
15. Larsen Soles TM. A strategic plan for eliminating rural hospital services through the process of regionalization. *Can J Rural Med* 2005;10:107-8.
16. Simpson SH. Of silos and systems: the issue of regionalizing health care. *Can J Hosp Pharm* 2011;64:237-8.
17. Statistics Canada. Structure and change in Canada's rural demography: an update to 2006. *Rural and Small Town Canada Analysis Bulletin*. Catalogue no. 21-006-X 2008; 7(7):1-29.
18. Canadian Healthcare Association. *Guide to Canadian healthcare facilities 2009-2010*. Ottawa (ON): Canadian Healthcare Association; 2010. p. 1-542.
19. Nivala AM, Brewster S, Sarjakoski LT. Usability evaluation of Web mapping sites. *Cartograph J* 2008;45:129-38, doi:10.1179/174327708X305120.
20. Kobayashi S, Fujioka T, Tanaka Y, et al. A geographical information system using the Google Map API for guidance to referral hospitals. *J Med Syst* 2010;34:1157-60, doi:10.1007/s10916-009-9335-0.
21. Masino C, Rubinstein E, Lem L, et al. The impact of telemedicine on greenhouse gas emissions at an academic

- health science center in Canada. *Telemed J E Health* 2010;16:973-6, doi:10.1089/tmj.2010.0057.
22. Rourke JTB, Kennard M. Emergency patient transfers from rural hospitals: a regional study. *CJEM* 2001;3:296-301.
 23. Bosk EA, Veinot T, Iwashyna TJ. Which patients and where: a qualitative study of patient transfers from community hospitals. *Med Care* 2011;49:592-8, doi:10.1097/MLR.0b013e31820fb71b.
 24. Hains IM, Marks A, Georgiou A, et al. Non-emergency patient transport: what are the quality and safety issues? A systematic review. *Int J Qual Health Care* 2011;23:68-75, doi:10.1093/intqhc/mzq076.
 25. Canadian Institute for Health Information. *Statistiques éclairées: divers équipements d'imagerie au Canada*. 2011. Available at: http://apps.cihi.ca/MicroStrategy/asp/Main.aspx?server=torapprd30.cihi.ca&project=Quick+Stats&uid=pce_pub_en&pwd=&evt=2048001&visualizationMode=0&documentID=50A7B0D5472B6AE40A9AE7AA062D42EC (accessed January 7, 2013).
 26. Kocher KE, Meurer WJ, Fazel R, et al. National trends in use of computed tomography in the emergency department. *Ann Emerg Med* 2011;58:452-62, doi:10.1016/j.annemergmed.2011.05.020.
 27. Joynt KE, Harris Y, Orav EJ, et al. Quality of care and patient outcomes in critical access rural hospitals. *JAMA* 2011;306:45-52, doi:10.1001/jama.2011.902.
 28. Humber N, Frecker T. Rural surgery in British Columbia: is there anybody out there? *Can J Surg* 2008;51:179-84.
 29. Kornelsen J, Grzybowski S, Iglesias S. Is rural maternity care sustainable without general practitioner surgeons? *Can J Rural Med* 2006;11:218-20.
 30. Gray A, Gill S, Airey M, et al. Descriptive epidemiology of adult critical care transfers from the emergency department. *Emerg Med J* 2003;20:242-6, doi:10.1136/emj.20.3.242.
 31. Gomez D, Bérubé M, Xiong W, et al. Identifying targets for potential interventions to reduce rural trauma deaths: a population-based analysis. *J Trauma* 2010;69:633-9, doi:10.1097/TA.0b013e3181b8ef81.
 32. Haas B, Stukel TA, Gomez D, et al. The mortality benefit of direct trauma center transport in a regional trauma system: a population-based analysis. *J Trauma Acute Care Surg* 2012;72:1510-7, doi:10.1097/TA.0b013e318252510a.
 33. McKenna C. Medical system in northern B.C. 'systematically helps people die,' critics say. *The Vancouver Sun* 2013 Apr 7; British Columbia and Quebec sections.
 34. Statistics Canada. *Population by year, by province and territory*. 2012. Available at: <http://www.statcan.gc.ca/tables-tableaux/sum-som/101/cst01/demo02a-eng.htm> (accessed January 7, 2013).
 35. Statistics Canada. *Table 105-0501: Health indicator profile, annual estimates, by age group and sex, Canada, provinces, territories, health regions (2011 boundaries) and peer groups*. 2011. Available at: <http://www5.statcan.gc.ca/cansim/pick-choisir?id=1050501&searchTypeByValue=1&pattern=1050501&retrLang=eng&lang=eng> (accessed January 7, 2013).
 36. Ministère de la Santé et des Services sociaux du Québec. *Guide de gestion de l'urgence*. 2006. Available at: <http://publications.msss.gouv.qc.ca/acrobat/f/documentation/2006/06-905-01.pdf> (accessed January 7, 2013).
 37. Fleet R, Archambault P, Légaré F, et al. Portrait of rural emergency departments in Quebec and utilisation of the Quebec Emergency Department Management Guide: a study protocol. *BMJ Open* 2013;3:1-6.
 38. Canadian Institute for Health Information. *Tendances des dépenses nationales de santé, 1975 à 2012*. Available at: https://secure.cihi.ca/free_products/NHEXTrendsReport2012FR.pdf (accessed January 28, 2013).

APPENDIX: THE STRUCTURED TELEPHONE INTERVIEW PROTOCOL

ED and Hospital General Questions

1. Is your ED working 24/7 with constant physician coverage? (yes/no)
Yes No Not sure
2. How many stretchers do you have in the ED?
3. Would you say it is a fair assessment to consider your hospital to be located in a rural setting? (yes/no)
Yes No Not sure
4. How many acute care beds does the hospital have?
5. How many people visited the ED in the last year (number of visits/year)? (often required extra time for verification and call-back necessary)
6. What is the size of the population in your hospital's service area? (respondents often unable to answer and limited information in database)
7. What is the major referral hospital associated with yours?
8. How much time does it take to travel from your hospital to the major referral hospital in the best weather conditions?
9. How much distance is that in kilometres?
10. What is the closest designated trauma centre? (actual Level 1 and Level 2 trauma centre verification required and distances verified with *Google Maps*)
11. By which way are patients transferred to the tertiary trauma centre that is nearest to your hospital?
Airplane/helicopter Ambulance Both

ED Technical and Staff Support

12. Does your emergency staff have 24/7 on-site (or on-call) access to (we made very clear that interested in local service only):
 - a. Laboratory services?
Yes No Not sure

- b. An x-ray?
Yes No Not sure
- c. A CT scanner?
Yes No Not sure
- d. An MRI?
Yes No Not sure
- e. A bedside sonogram?
Yes No Not sure
- f. A respiratory technician?
Yes No Not sure
- g. An on-call general surgeon?
Yes No Not sure
- h. An on-call pediatrician?
Yes No Not sure
- i. An on-call obstetrician-gynecologist?
Yes No Not sure
- j. An on-call internal medicine physician?
Yes No Not sure
- k. An on-call orthopedist?
Yes No Not sure
- l. An on-call anesthesiologist?
Yes No Not sure
- m. An ICU? (accepted step-down unit, coronary care unit)
Yes No Not sure