INTRODUCTION

The practice of emergency medicine in rural areas in Canada represents a significant challenge, and there is a lack of knowledge to properly understand this issue.1 2 The majority of research on emergency medicine is conducted in tertiary academic centres with patients from urban areas. It is important to study the particular difficulties encountered by rural emergency departments (ED), as these EDs constitute a safety net of sorts for the 20% of Canadians who live in rural areas.3

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Healthcare professionals and patients in rural areas in Canada face numerous problems—reduced access to specialised care,4 5 medical imaging (tomodensitometry (TDM), ultrasound, MRI)9 10 and intensive care units; geographical distance from specialised centres and deficient means of transportation.11 Further challenges for rural emergency care include problems with personnel recruitment, level of training in emergency medicine and infrequent experiences with complex cases.12 Further, several provinces have centralised their medical care to reduce costs,7 13–15 resulting in limited access to local services and specialised care, and increased pressure on prehospital emergency care (PEC).13 14 16 Limited access in rural regions to primary care,4 17 mental healthcare and to long-term care and services centres (LTC) may increase the number of visits to EDs.18 Finally, risk of death subsequent to major trauma is considerably higher in rural regions and a correlation between geographical isolation and mortality3 10 19–23 has been observed. These problems impact a significant proportion of Canada’s population. Given that the geographic factor is not changeable, it is imperative to identify factors that could potentially be modified to help resolve these problems.

EMERGENCY DEPARTMENT MANAGEMENT GUIDE

In 1997, the Canadian Association of Emergency Physicians (CAEP) presented its position on rural emergency medicine in Canada.12 Owing to the lack of research data on the issue at the time, the document was based on expert consensus. The position paper was created to inform the development of a framework to evaluate medical practices in rural EDs. The CAEP document did not, however, include specific recommendations about appropriate patient transportation times or access to TDM or other specialised services.

However, the publication of the Emergency Department Management Guide24 in 2006 by the Quebec Ministry of Health and Social Services (MSSS) raised a number of critical issues related to rural EDs. Developed by a multidisciplinary group of key policy-makers, the Management Guide24 is, to our knowledge, the most recent and concise available document. It specifies the services that should be accessible in the province’s EDs based on the number of annual visits to the department and other variables. The guide24 also includes several recommendations for solving the problems faced by rural EDs. In brief, this forward-thinking guide24 could provide a starting point for the development of management standards in Canadian rural EDs. To date, no studies evaluating its implementation in rural areas have been conducted.

Shortage of healthcare professionals in rural areas

The challenges related to rural emergency medicine are multiple and significant. In particular, problems related to the vulnerability of recruitment and retention of healthcare professionals must be addressed. Despite the critical nature of the problem, there is a significant lack of data about this sector and about healthcare services for the rural Canadian population.1 A systematic search of Cochrane Reviews yields a complete absence of rigorous studies that adequately evaluate efforts to recruit and retain healthcare professionals in rural areas. This problem is not on the verge of resolution; according to the National Physician Survey,25 26 only 1% of family medicine residents plan to eventually practice in rural regions, and rural family doctors tend to leave emergency medicine after only a few years. Anecdotal evidence suggests that such departures are prompted by high stress, difficult schedules and poor quality of life. Combined, these factors make training and recruiting emergency physicians in rural areas a considerable challenge.

Observational studies1 26–32 describe several factors that could improve retention of healthcare professionals in rural areas. Promising strategies include selection of rural students for professional training programmes, establishment of university departments and training units in rural regions, provision of grants for students who commit to working in rural areas and development of personal and professional support programmes for professionals working in rural zones.

The Management Guide24 also proposes interventions to increase recruitment and retention of healthcare professionals in rural areas—encouraging multidisciplinary training for healthcare professionals; ensuring access to necessary and appropriate material and technical resources and help from colleagues, specialists and surgeons when necessary; increased access to specialised treatment centres and access to continuing education. The guide24 also suggests reasonable work and on-call schedules, attractive salaries and adequate benefits. Finally, it proposes the following suggestions for recruiting and retaining healthcare professionals in rural areas:

- an environment conducive to raising and educating a family; a stimulating social and cultural environment and employment opportunities for the healthcare professional’s partner and finally, the prospect of an overall high standard of living and excellent quality of life. The implementation of these recommendations in Quebec needs to be explored.

Trauma, prehospital emergency care and inter-establishment transfers

Trauma is one of the most common reasons for a consultation in the ED; correspondingly, it is the most frequently studied subject in research on rural medicine. Trauma is also the leading cause of mortality in individuals under 40 and the fourth most common cause of mortality for people of all ages.3 33 For over 30 years, major investments have been made in developing traumatology networks.20 These networks have benefitted urban patients, but the results are less robust for rural patients who are often geographically isolated from designated trauma centres, necessitating complicated
inter-establishment transfers. In fact, in some provinces, up to 80% of patients in rural regions are over an hour away from tertiary trauma centres.

The distances between rural EDs and tertiary care or referral centres, and the elevated risk of medical trauma in rural areas are such that PEC is essential for rural residents. A recent American meta-analysis indicated that PEC response times are significantly longer in rural areas. This result can be attributed to greater travel distances, hazardous road conditions and to the challenge of locating and retrieving victims in rural areas. Another study demonstrated that the elevated rate of mortality subsequent to trauma in rural areas is partially attributable to lengthy transportation time in ambulances.

One critical component of rural emergency medicine is the transfer of more complex cases to a referral centre. Each transfer indicates the failure of the local centre to meet the patient’s critical needs. Every transfer involves considerable time and personnel, and exposes the patient to the risk of complications inherent to transportation by emergency vehicle. One Canadian study reported that almost 2% of all rural ED patients in Ontario had to be transferred to another establishment to receive more advanced emergency care. For a medium-sized rural ED in Quebec (20,000 annual visits), this can mean over 400 transfers per year. The rate of interestablishment transfers in Quebec rural EDs is a key variable to measure; an elevated transfer rate could indicate a local shortage or a problem in access to basic services.

Quality-of-care indicators in the emergency department
Research evidence suggests that evaluation of quality indicators and the publication of data about quality indicators improve quality of care. The recent publication of the Consensus on Evidence-Based Quality of Care Indicators for Canadian Emergency Departments permits objective measurement of EDs’ performances, allowing objective comparison among departments. Published in March 2010, this consensus was created by a panel of 24 Canadian experts including managers, clinicians, emergency medicine researchers, health information specialists and government representatives. Of 48 indicators selected, consensus was reached on eight groups of indicators determined to have the highest levels of priority and validity. The selected indicators are related to interventions for eight pathologies often treated in EDs, including myocardial infarction, stroke, sepsis, asthma and several paediatric problems related to infection.

The Management Guide was published after the consensus document and is therefore not mentioned in this important publication. However, quality of care is one of the central principles of the Management Guide. Although the eight established quality indicators are keys for future studies comparing performance between EDs, methodological limitations must be acknowledged. First, data on all of the indicators are not included in current clinical databases. Second, the scientific consensus committee did not include representatives from rural EDs, and certain quality indicators relevant to rural EDs may not be included (eg, trauma care in rural areas with limited access to traumatology centres and investigative technology, interestablishment transfer needs and the impact of these issues on quality of care).

OBJECTIVES
This project is designed to
1. Develop a comprehensive portrait of all rural EDs in Quebec;
2. Evaluate the use of the 2006 Emergency Department Management Guide.

A. Perceived usefulness and implementation of its various recommendations;
B. Factors that promote or impede the implementation in rural areas;
C. Relations between the implementation and performance indicators;
D. Relations between the implementation and healthcare professionals’ work-related quality of life.

METHODS AND ANALYSIS
This project is a descriptive and evaluative study of rural EDs in Quebec, which offer 24/7 medical coverage, having hospitalisation beds and are located in a rural or small town, according to the definition of Statistics Canada.

In a previously conducted pilot study, rural EDs were identified using the Health Canada Establishment Guide and confirmed by the MSSS and the Direction Nationale des Urgences. There are 26 rural EDs in Quebec.

Phase 1: portrait of all rural emergency departments
To develop a comprehensive portrait of all rural EDs in Quebec, a questionnaire will be sent by email to the chief nurse to collect data on (1) hospital centre characteristics (eg, referral centres, availability of local intensive care unit beds, number of acute and long-term beds); (2) availability of health information technology (eg, internet and Wifi access); (3) knowledge transfer activities (eg, quality assurance, book club); (4) ED variables (eg, triage level, wait time, average hospital stay, number of transfers between facilities); (5) available diagnostic services 24/7 (eg, lab, basic radiography, TDM, MRI, ultrasound, portable ultrasound); (6) medical and paramedical staff (eg, number of emergency doctors, years of experience and level of training, percentage of locum doctors per period, availability of specialists, number and level of training of nurses, presence of other health professionals); (7) pre-emergency and post-emergency care resources in the region (eg, number of family doctors, availability of convalescence beds); (8) long-term housing and care centres and mental health facilities (eg, number of beds, waiting list). Some data will also be gathered from databases at the MSSS (eg, number of annual visits), the Quebec Trauma Registry
(information on traumatic event, healthcare institution implied, emergency department, hospitalisation, patient acuity (triage level), etc), PEC centres (eg, number of ambulances deserving each rural hospital) and Statistics Canada (eg, data on population and rural regions).

For the first phase of the study, the project needs no further ethical evaluation since all of the data required is non-nominal.

**Phase 2: Emergency Department Management Guide**

First, an online survey about use of the *Emergency Department Management Guide* will be developed and administered electronically to the management personnel of the EDs included in the study (chiefs of staff, head nurse). Research staff will contact managers to introduce the project and to explain the online questionnaire. Regular follow-ups will be conducted to obtain the most complete responses possible. The survey will be developed using all the *Management Guide* recommendations (n=69) pertaining to rural hospitals. Respondents will respond on a seven-point Likert-type scale to two questions: (1) *To what extent is the recommendation useful in my hospital?*, (2) *To what extent is the recommendation used in my hospital?* Further, a telephonic interview will be conducted with the respondents to evaluate factors that promote or impede implementation of the recommendations perceived equally useful and not used.

Second, the following indicators will be used to explore the association between use of the *Management Guide* and performance and quality of care: (1) the performance indicators assessed in the first phase (eg, average ED stay) and (2) the following eight high-priority quality of care indicators established by Canadian consensus in the following categories: ED operations (eg, length of stay), patient security (eg, unplanned/unexpected readmissions), pain management (eg, delay in administration of medication), cardiac and respiratory problems (eg, treatment delay for thrombolysis, corticosteroid administration percentage), stroke (eg, delay in administration of plasminogenic tissue activator), and sepsis/infections (eg, delay in administration of antibiotics). Information missing from the databases will be obtained from patient medical files. The number of file reviews necessary to obtain the relevant information will vary by indicator.

To evaluate their quality of life, two online surveys will be administered to all consenting nurses and doctors working at rural EDs. The exact number of professionals to complete the survey will vary between EDs, but the expected response rate is 70%. In an effort to boost response rate, we will telephone hospital spokespersons (eg, head nurse) to establish contact and explain the procedure.

The first survey refers to the quality-of-work life systemic inventory (*QWLSI*) and will be available for completion via http://qualitedevie.ca. The measure includes 34 themes divided into 8 subgroups: remuneration, professional development, work schedule, social environment/relationships with colleagues, relationships with superiors, physical environment, factors that influence employees’ perception and enjoyment of the task and employee support. A supplementary module of six questions will be designed to capture aspects specific to ED, which are not covered by the existing 34 items. The *QWLSI* provides an organisational diagnosis and permits comparison with over 3000 workers who have already completed the measure. The internal validity (Cronbach’s α) of the subgroups ranges from 0.60 to 0.82. The overall internal validity is 0.88 and the test–retest reliability is 0.85. The English language and French-language versions are equivalent (0.84). Lower scores (below the 25th percentile) indicate greater psychological distress and professional burnout. The second survey contains questions about sociodemographic variables, and factors related to recruitment and retention and will also be completed online.

**Statistical analyses**

The statistical analyses will be achieved in collaboration with the biostatistics service from the Unité de recherche en santé des populations du Centre hospitalier affilié universitaire de Québec. The data collected as part of the phase 1 will be described as means, medians and percentages, according to the variables distribution to meet the objective 1. To meet the objective 2.1, the mean of six-point Likert scores measuring the use and usefulness of the guide will be presented for each of its recommendations. Likert scores will also be dichotomised with the intention of showing the agreement or disagreement between the utilisation and usefulness of the guide, which will allow to calculate the mean number of useful recommendations, the mean number of applied recommendations and the proportion of ED where at least 70% of recommendations are applied. Answers to the questions concerning the perceived usefulness and utilisation will be compared to evaluate the level of application of recommendations considered useful. The participants’ telephonic interview answers (objective 2.2) will be qualitatively analysed to show the obstacles and facilitators considered to be the most important to the implementation of the guide. With the aim of meeting the objective 2.3, the relation between the use of the *Management Guide* and the performance and quality-of-care indicators will be measured with Spearman correlation. The utilisation of the guide will be measured by the mean number of applied recommendations in ED. Finally, regarding the objective 2.4, the results of the two surveys will be presented with descriptive statistics in a first phase. The association between the *QWLSI* score and utilisation of the guide will be assessed with the aid of a generalised estimation equations model to take into consideration the correlation between the responders from a same ED. The utilisation of the guide will be measured by the number of recommendations applied (objective 2.1 analyses) and processed as a continuous or dichotomous variable. The data collected during phase 1 as well as information on characteristics of responders collected
during the second survey of the objective 2.4 will serve as adjustment variables in the model. However, if the sample size does not allow such analyses in objective 2.4, the association between the quality-of-life scores and utilisation of the guide will be measured with Spearman correlation coefficients. Furthermore, some correlational analyses will allow to compare the quality-of-work life scores and some retention and recruitment factors.

ETHICS AND DISSEMINATION
This rural project required ethics evaluation through a complex multicenter study mechanism described below. In the province of Québec, a study that is conducted in several centers must conform to an established ethics procedure according to the MSSS. Two preliminary steps must be undertaken. First, the project must be peer reviewed by a recognized expert committee (e.g., Scientific research committee). Second, a main research center ethics committee (main REC), which is normally the REC that belongs to the research center where the project is initiated, must be determined. When these two conditions are fulfilled, the principal investigator sends the project to the main REC, to each local REC (if applicable, otherwise no review occurs) and to every participating study site. Once the local RECs have reviewed the project, they send their comments to the main REC, which takes into consideration their specific requests and decides to approve/reject the project within 2 weeks following the examination. When the expectations of the main REC are satisfied, the preliminary decision is sent to the principal investigator and to every participating study site. A feasibility study committee, which evaluates the practicability of the project in each institution, must submit its evaluation to the institutional director (Hospital CEO or director) before the end of the ethical procedure. Once the ethics and feasibility examinations are completed, the decision is reviewed by each local REC (or its designed authority if it does not have its proper REC). Once the local REC (or its designed authority) approves this decision, it sends it to the institution. Furthermore, the feasibility study committee forwards its decision to the general management of the institution, which will relay its decision to the main REC. Finally, the main REC sends its final decision to the principal research coordinator and to each institution and REC implied in the project.

The phase 1 of this study was exempted from ethical evaluation as no human subject was involved. The phase 2 of this study has been approved by the CSSS Alphonse–Desjardins main REC (Project MP-HDL-1213-011). Results from this study will be published in peer-reviewed scientific journals and presented at one or more scientific conferences.

DISCUSSION
To our knowledge, this will be the first study to evaluate EDs in rural Quebec and Canada at such a broad scale. It will provide a greater understanding of the factors that promote and impede the implementation of the recommendations in the Management Guide. The results could be used to develop one or several interventions designed to increase implementation of the Management Guide recommendations. The questionnaire could also be used to investigate the implementation of the Management Guide in EDs outside Quebec and Canada by researchers wishing to test the implementation of a management guide adapted to their own region and context.

Our use of performance indicators recently published by Schull and colleagues to measure the impact of a knowledge transfer tool (a practical guide) on EDs performance is a further innovation that could advance knowledge transfer research. We plan to identify performance indicators that are specific to rural EDs and were not included in the list of indicators published by Schull and colleagues. Eventually, we wish to explore the impact of the use of the Management Guide on the quality of care offered in Quebec relative to that offered in other Canadian provinces. The proposed project would allow us to establish an essential knowledge base that would serve to plan a future comparison with EDs in other provinces.

The results of this study will also allow a greater understanding of the factors associated with work-related quality of life in ED healthcare professionals, and those relevant to recruitment and retention of ED personnel. The research evidence generated by this study could also be used to develop interventions that could, in turn, be evaluated using the same questionnaires.

Finally, our results will undoubtedly be useful to policymakers and can be used to guide the distribution of healthcare services in rural areas. The results will provide policymakers with a greater understanding and appreciation of the unique challenges faced by rural EDs in the province. The results will contribute to the bank of available research data that can be used to develop policies about attribution of resources in rural areas. Ultimately, this project will contribute to improved health in rural Quebec.

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