The challenges of measuring quality of care indicators in rural emergency departments in Quebec – a cross sectional descriptive study

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Abstract

Background: Recently, using modified Delphi methods, quality of care indicators (QCI) were developed to improve care and performance in emergency departments (EDs). The feasibility of measuring these QCI has been mainly tested in urban and academic EDs. Therefore, we sought to assess the feasibility of measuring them in rural EDs in Quebec.

Methods: We identified 26 rural EDs in the province of Quebec, Canada, that offer 24/7 medical coverage, have hospitalization beds, and are located in rural or small towns as defined by Statistics Canada. Nineteen of them agreed to participate in this study. A standardized protocol was sent to each ED to collect data on 27 validated QCI. Data were collected by local professional archivists between June and December 2013. Descriptive statistics are presented as percentages, means, median and standard deviation (SD).

Results: A total of 58% (n=15/26) of Quebec's rural EDs completed the data collection process. It was only possible to measure 40% of the indicators using heterogeneous databases and even manual extraction. The 15 participating centres collected data from 15 different databases or combinations of databases. Data collection time for each indicator varied from 5 to 88.5 minutes (SD = 83.5 minutes).

Interpretation: Overall, priority QCI were difficult to measure in Quebec's rural EDs databases. Further work is warranted to improve standardized measurement of quality indicators in rural EDs in Quebec, and to generalize the information gathered in this study to other health care environments.

INTRODUCTION

Providing equitable quality emergency care to rural citizens in a vast country with limited financial and human resources in a great challenge. Twenty percent of Quebec's population lives in rural regions [1] and rural emergency departments (EDs) receive an average of 19,000 visits per year [2-6] in this province. Given the limited access to diagnostic services, family doctors and other specialists in rural areas, rural EDs constitute an essential safety net for this population [2-4, 7]. Furthermore, in an effort to limit the inherent costs related to EDs in rural regions, several Canadian provinces have reduced or regionalized these services [8-10]. As a result, numerous hospitals have been forced to reduce services or to close altogether [11]. The impact of this situation on the quality of care is not well known. Timely attempts to measure and monitor quality of care in rural emergency departments are thus warranted.

To reach this goal, evidence-based and measurable Quality of Care Indicators (QCI) are required. The recent publication of Schull et al. entitled Development of a Consensus on Evidence-Based Quality of Care Indicators for Canadian Emergency Departments [12] takes us a step closer to this objective. 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 [12].

Of 48 indicators selected, a consensus was reached on eight groups of indicators determined to have the highest priority and validity. The selected indicators are related to interventions for life-threatening pathologies often treated in EDs, including myocardial infarction, stroke, sepsis, asthma and several pediatric problems related to infection. The eight indicator groups were divided into sub-indicators for a total of 27 indicators (appendix 1). These QCI were

developed through an extensive modified Delphi process, and are now considered the reference standard in Canada for evaluating quality of care in EDs [12].

It is expected that QCI will allow clinical staff, administrators, and researchers to identify areas where clinical care improvement is most needed, establish bench-marks, and compare care across EDs in a valid and reliable way [13]. QCI could have a significant impact on the quality of care provided to rural citizens [12, 13]. The implementation and regular follow-up of QCI could help standardize access to quality care in rural areas, identify the needs of the population, and improve organization of care. The end goal is for rural patients to receive the standard treatment for their medical condition, rather than care that simply reflects the resources available in the area.

However, there are practical limitations related to measuring QCI in rural EDs. First, information on QCI may not be available in clinical databases in every rural ED. Second, collection of data on certain priority QCI could be difficult in rural establishments due to lack of resources [14].

To the best of our knowledge, QCI have not yet been studied in rural EDs.

OBJECTIVES : The primary objective of this study was therefore to investigate the feasibility of measuring the QCI defined by Schull et al. [12] in rural EDs in Quebec and to identify potential barriers to the implementation of this practice.

METHODOLOGY

Setting and study design

The study was approved by the research ethics committee at the research centre of the Hôtel-Dieu de Lévis, a university-affiliated hospital in Quebec, Canada. This is a sub-study of a larger cross-sectional multicentre research (fig 1) [4, 15]. In the previous study, rural EDs in Quebec were selected according to the following criteria: 24/7 medical coverage with hospital beds; and situated in a rural region as per the Statistics Canada definition [16]. Rural EDs were identified using the Guide to Canadian Health Care Facilities [17] and confirmed by the provincial Ministry of Health and Social Services and the Quebec Director of Emergency Departments. Using these criteria, we identified a total of 26 rural EDs. Further methodological details of the Quebec rural study are provided in the published protocol [18]. An institutional convenience demand was sent to all eligible EDs (26) to participate in this study. Of this, 23 accepted to participate in the phase 1 of the study and 19 in phase 2 (see participating centre flow diagram in figure 1). The final simple was 15 centres.

Source of data

Data collection was conducted from June to December 2013. A QCI data collection protocol was developed. The 27 indicators from the eight priority categories were described and explained in a Microsoft Word document, and an Excel spreadsheet was created in order to standardize data collection from the EDs' patient databases. The research centre archivists pre-tested the protocol to ensure standardized measurement using the QCI Conference calls with the head of medical archives were held in each of the 19 participating EDs. The objective of the calls was to introduce the study and identify the individual in charge of data collection at each ED. The QCI data collection protocols were emailed to the medical archives specialists. Data were collected from databases and patient medical files at each participating rural hospital. A graduate student/physician (GL) and a research nurse made weekly telephone or email follow-ups to

ensure that proper procedures were followed. In order to assess the validity of the measurement of the QCI, a graduate student/ physician (GL) and a research nurse made weekly telephone or email follow-ups to ensure that proper procedures were followed.

Statistical analysis

Data were analysed using descriptive statistics (mean, median, proportion). All analyses were conducted using SAS software. The centres were denominalized and coded from 1 to 15.

RESULTS

Sample size and participation rate

Seven of the 26 rural EDs in Quebec declined to participate in this phase of the project. Reasons for non-participation were mainly attributed to lack of human resources. Of the remaining 19 rural EDs, four centres were later excluded for failure to complete data collection due to lack of time and personnel. The final sample included 15 centres, representing a participation rate of 58% (n=15/ 26) of Quebec's rural EDs.

QCI measurements

Table 1 shows the proportion of measurable QCI. One indicator (QCI 11.1) was not measurable using any of the databases in any of the participating centres. The majority (over 50%) of the "duration of stay" and "patient safety" indicator categories were measurable in the centres. However, less than 40% of the "pain management", "pediatrics", "respiratory" or "stroke" QCI categories were measurable.

Database use for QCI measurement

Archivist's ability to successfully measure the 27 QCI by using database varied across centres. Centres 2, 5, 6, and 13 used databases in over 75% of cases. In contrast, centres 3, 8, 9, 11, 12, and 15 measured QCI using databases in less than 20% of cases (Table 2). The participating centres searched 15 different databases and 15 combinations of databases (in the case where the archivist was willing to use two or more databases for one or more indicators). In total, archivists in the 15 centres collected data from 15 different databases (appendix 2).

Time to measure QCI

The total time required for each centre to measure the 27 indicators ranged from five minutes to 88.5 minutes (SD = 83.5 minutes). Data collection time for each individual QCI was under 15 minutes in most cases, except for indicators 6, 9, 11.5, and 11.6, for which median time exceeded 30 minutes (Table 3).

DISCUSSION

To the best of our knowledge this is the first study to assess the feasibility of measuring established priority QCI in rural EDs in Quebec. The good participation rate (58%) in this project, in spite of it being highly resource-intensive, suggests that healthcare personnel in rural settings are interested in measuring quality of care and consider it important. Despite the difficulties in data collection reported by archivists in the present study, several key methodological requirements, such as using a standard data capture protocol, were closely followed over the course of the study and constitute a strength of this project. Despite short-staffing in rural establishments, each archivist conscientiously completed the task of data collection. The data collection methods used could foster standardized and reproducible

measurement of some of the QCI in the 15 centres included in this study. Further analysis of actual performance on these indicators will be the focus of a subsequent report.

Our main results showed that the existing ED databases do not permit measurement of several established evidence-based QCI. Specifically, it was only possible to measure 40% of the indicators using manual extraction and heterogeneous databases. The 15 participating centres collected data from 15 different databases or combinations of databases, and the process of extracting the data was time-consuming. Our research suggests that the quality of databases and access to them are the most important feasibility considerations. Information on several different indicators was inaccessible, and archivists were obliged to conduct manual searches of paper patient files to extract QCI data. Manual consultation of paper files is resource-intensive for archives personnel and required the use of several intermediaries, discouraging some participants and resulting in failure to measure several indicators. Furthermore, even for those centres with access to databases, the information they contained was not useful for measuring the QCI, and the archivists had to resort to considerable data manipulation in order to measure the quality indicators.

Explanation and comparison with other studies

Our results coincide with those of Schull et al.,[14], whose feasibility assessment in urban centers determined that 13 (27%) of 48 indicators could be measured using current data elements in the Canadian Institute for Health Information's (CIHI) National Ambulatory Care Reporting System (NACRS) or NACRS plus linkage with other existing administrative databases such as that of CIHI, Discharge Abstracts Database (DAD), or death records. These 13 indicators do, however, include some higher-priority indicators for ED operations, such as

patient safety, and sepsis or infection [12]. Also, an earlier study by Lindsay et al., [13] found limited feasibility of calculating these indicators by applying them to a routinely collected data set. Of 29 QCI identified by Lindsay et al. only eight were captured due to lack of sufficient specificity within the NACRS and International Classification of Diseases-9 (ICD) coding systems to satisfy the operational definitions, and due to the need to link the ED visit to inpatient databases [13]. While the Ontario healthcare system is reputed for the quality of its databases [19], other healthcare systems face challenges in measuring well-established QCI, especially small rural settings with limited resources/ databases.

Limitations

Because of limited resources, we did not plan or conduct inter-rater reliability assemements on QCI capture work conducted by archivists. We initially thought this work would be straight forward with existing databases and provided written protocol to capture QCI. This assumption was incorrect and is hence a major finding of this study. Furthermore, because of the difficulties in collecting data experienced by archivists, the data collected was incomplete, limiting the use of multivariate statistical analyses. No correlations could be calculated to determine whether or not a relationship existed between the databases used and the quality of QCI data collected.

Conclusions and implications for practice and future research

This study demonstrates that we do not yet have the means to evaluate their practical applicability. This study was thus a much-needed exercise in identifying the challenges inherent in collecting QCI data in rural EDs. Whether these QCI can apply in rural areas raises other important issues: Is it even possible for a rural ED to provide thrombolytic treatment if it does not have access to a local CT scanner? Also, are there more important or albeit basic indicators

that need to be measured in rural EDs? For example, wait times for imaging/ surgical consultation in suspected acute conditions such as appendicitis? Considering our previous finding that less than 20% of rural EDs in Canada have 24/ 7 in-hospital access to CT scanners and general surgery, this may be an important category to assess in rural emergency care. Moreover, since trauma is reportedly more common in rural than urban settings and since rural EDs are on average 300 km from trauma centres [2-4] , should specific QCI be developed for rural trauma? Finally as rural EDs are often distant from tertiary referral centres, inter-facility ambulance/ air transport are a critical link in the chain of rural emergency care. QCI should probably be developed for these services too, as decisions to transfer, means of transfer (physician/ nurse escort, air/ road), transfer times and transfer management are currently highly variable across rural Canada, and there is a lack of evidence about these services. As such, Schull et al's QCIs [12] could be viewed as a strong methodological and clinical basis for developing priority rural emergency QCI. Furthermore, we intend to complete this research project with a qualitative study designed to identify the factors that limited the data collection on quality indicators. This follow-up will generate new research hypotheses concerning barriers and facilitators to data collection on quality indicators and facilitate development of new uniform databases with the help of key provincial stakeholders.

INTERPRETATION

This article describes the first study to assess the feasibility of measuring Schull et al's [12] quality of care indicators in rural EDs in Quebec. As presently defined, Schull et al's [12] quality indicators are not easily captured using existing databases. In particular, indicators concerning pediatrics, respiratory care, and stroke are most difficult to measure in rural EDs in Quebec. Further work is warranted to improve standardized measurement of quality indicators

in rural EDs in Quebec, and to generalize the information gathered in this study to other health care environments.

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Figure 1: Participating center flow chard in the project « Portrait of rural emergency departments in Quebec and utilisation of the Quebec Emergency Department Management Guide »

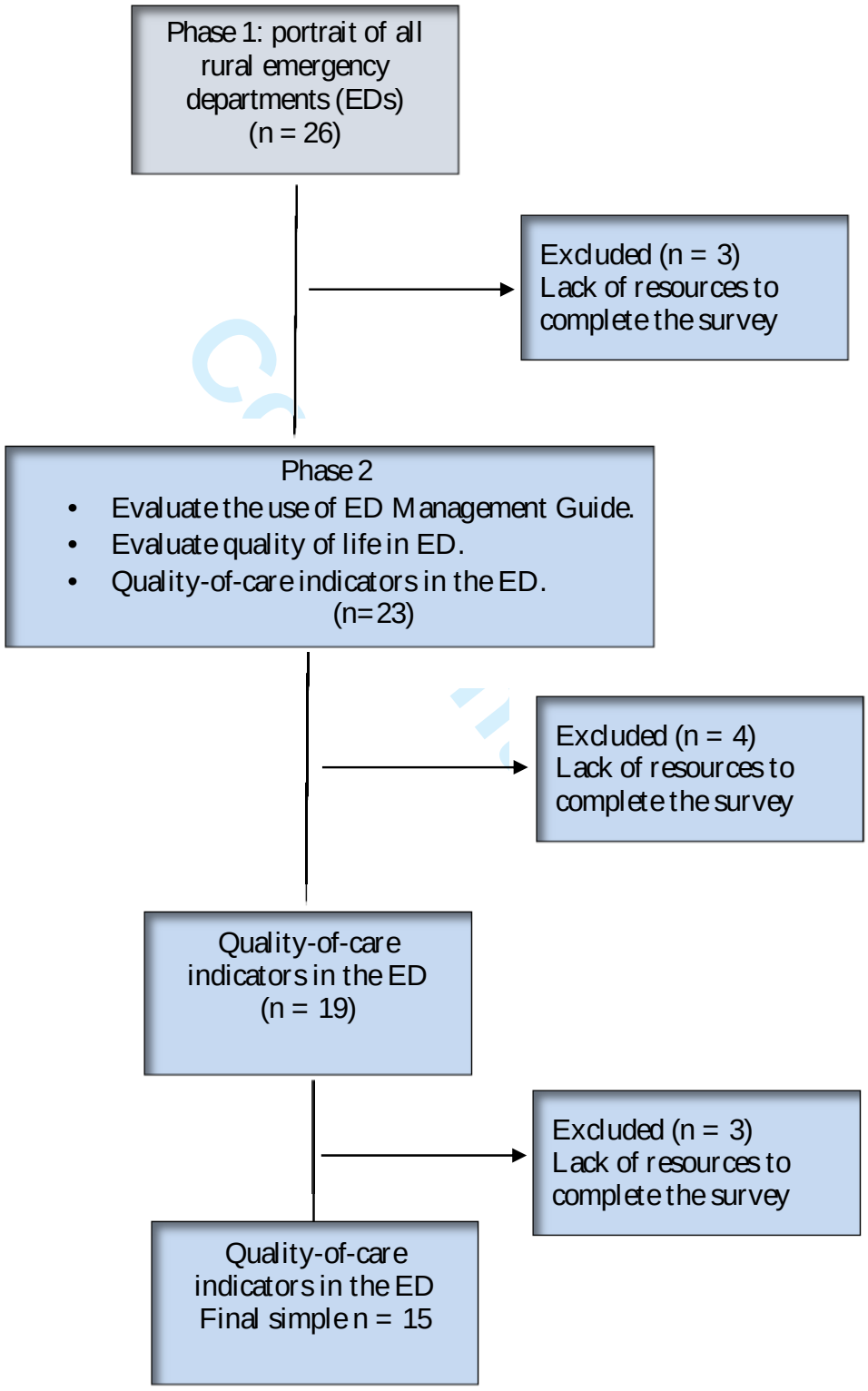

Table 1: Proportion of centres capable of measuring individual QCI

Quality indicators (QCI)	Frequency n (%)
Duration of Stay	
QCI_2-1	9/ 15 (60)
QCI_2-2	9/ 15 (60)
QCI_2-3	10/ 15 (66.66)
QCI_2-4	10/ 15 (66.66)
QCI_2-5	10/ 15 (66.66)
Patient safety	
QCI_3-1	10/ 15 (66.66)
QCI_3-2	9/ 15 (60)
QCI_4-1	8/ 15 (53.33)
QCI_4-2	7/ 15 (46.67)
QCI_5	11/ 15 (73.33)
Pain management	
QCI_6	4/ 15 (26.67)
Pediatrics	
QCI_7	6/ 15 (40)
QCI_8	5/ 15 (33.33)
QCI_9	5/ 15 (33.33)
Cardiology	
QCI_10	9/ 15 (60)
Respiratory care	
QCI_11-1	0/ 15 (0)
QCI_11-2	6/ 15 (40)
QCI_11-3	6/ 15 (40)
QCI_11-4	6/ 15 (40)
QCI_11-5	6/ 15 (40)
QCI_11-6	6/ 15 (40)
QCI_11-7	6/ 15 (40)
QCI_11-8	6/ 15 (40)

Quality indicators (QCI)	Frequency n (%)
Stroke	
QCI_12	6/ 15 (40)
Sepsis/ infection	
QCI_13	8/ 15 (53.33)
QCI_14	7/ 15 (46.67)

Table 2: Frequency (%) of database use to measure QCI (n = 27) by centre

Centres	Frequency (%) of database use for measuring QCI (by centre)
Centre 1	12/ 27 (44)
Centre 2	23/ 27 (85)
Centre 3	1/ 27 (4)
Centre 4	15/ 27 (56)
Centre 5	21/ 27 (78)
Centre 6	24/ 27 (89)
Centre 7	12/ 27 (44)
Centre 8	5/ 27 (19)
Centre 9	2/ 27 (7)
Centre 10	13/ 27 (48)
Centre 11	0/ 27 (0)
Centre 12	0/ 27 (0)
Centre 13	25/ 27 (93)
Centre 14	12/ 27 (44)
Centre 15	3/ 27 (11)

Table 3: Median time (min) to measure individual QCI for the 15 participating centres

Quality indicators	Median (min)	(Q1-Q3) (min)
QCI_1 (N=9)	4	3-5
QCI_2-1 (N=7)	3	6-1
QCI_2-2 (N=4)	4	2.5-6
QCI_2-3 (N=1)	15	15-15
QCI_2-4 (N=1)	1	1-1
QCI_2-5 (N=1)	1	1-1
QCI_3-1 (N=7)	9	3-24
QCI_3-2 (N=5)	4	3-13
QCI_4-1 (N=5)	6	4-11
QCI_4-2 (N=4)	3.5	2-69.5
QCI_5 (N=8)	13.5	12-35
QCI_6 (N=2)	78	72-84
QCI_7 (N=4)	12	4.5-21
QCI_8 (N=2)	4.5	3-6
QCI_9 (N=2)	115.5	6-225
QCI_10 (N=7)	15	12-25
QCI_11-1 (N=3)	18	6-54
QCI_11-2 (N=3)	18	6-54
QCI_11-3 (N=2)	15	6-24
QCI_11-4 (N=2)	12	6-18
QCI_11-5 (N=2)	30	6-54

Quality indicators	Median (min)	(Q1-Q3) (min)
QCI_11-6 (N=2)	30	6-54
QCI_11-7 (N=2)	12	6-18
QCI_11-8 (N=2)	6	6-6
QCI_12 (N=4)	10	4.5-23.5
QCI_13 (N=7)	5	1-12
QCI_14 (N=4)	13.5	6.5-16.5

Appendix 1: Priority quality of care indicators (QCI) identified by Schull *et al*

Duration of Stay
QCI 1. Average delay between ED arrival and physical departure from the ED QCI 2. Average delay between ED arrival and physical departure from the ED according to the triage scale QCI 2.1 Triage level P1 QCI 2.2 Triage level P2 QCI 2.3 Triage level P3 QCI 2.4 Triage level P4 QCI 2.5 Triage level P5
Patient Safety
QCI 3. Percentage of pediatric patients released from the ED who returned unexpectedly and were admitted within 48-72 hours of initial release QCI 3.1 Number of pediatric patients released from the ED who returned unexpectedly and were admitted within 48-72 hours of initial release QCI 3.2 Number of pediatric patients released from the ED who returned unexpectedly within 48-72 hours of initial release QCI 4. Percentage of adult patients released from the ED who returned unexpectedly and were admitted within 48-72 hours of initial release QCI 4.1 Number of adult patients released from the ED who returned unexpectedly and were admitted within 48-72 hours of initial release QCI 4.2 Number of adult patients released from the ED who returned unexpectedly within 48-72 hours of initial release QCI 5. Percentage of headache patients released from the ED and admitted to the hospital for subarachnoid hemorrhage (SAH) in the subsequent 14 days
Pain management
QCI 6. Delay before receiving first dose of analgesic for all pain conditions requiring analgesic
Pediatrics
QCI 7. Percentage of pediatric patients (0-28 days old) with fever who received a

complete sepsis workup QCI 8. Percentage of pediatric patients (0-28 days) who received broad-spectrum intravenous antibiotics QCI 9. Percentage of pediatric patients (3 months to 3 years) with croup who were treated with steroids
Cardiology
QCI 10. Percentage of eligible patients with acute myocardial infarction who received thrombolytic therapy or interventional angioplasty
Respiratory Care
QCI 11. Percentage of asthma patients (by age group) who received corticosteroids at the ED and at release (if released) QCI 11.1 Number of asthma patients (by age group) who received corticosteroids at the ED and at release (if released) QCI 11.2 Number of asthma patients (0-3 years) who received corticosteroids at the ED and at release (if released) QCI 11.3 Number of asthma patients (4-10 years) who received corticosteroids at the ED and at release (if released) QCI 11.4 Number of asthma patients (11-17 years) who received corticosteroids at the ED and at release (if released) QCI 11.5 Number of asthma patients (18-39 years) who received corticosteroids at the ED and at release (if released) QCI 11.6 Number of asthma patients (40-59 years) who received corticosteroids at the ED and at release (if released) QCI 11.7 Number of asthma patients (60-79 years) who received corticosteroids at the ED and at release (if released) QCI 11.8 Number of asthma patients (80 plus) who received corticosteroids at the ED and at release (if released)
Stroke
12. Percentage of acute CVA eligible patients who received thrombolytic therapy
Sepsis/ infection
13. Delay of antibiotic administration for patients with bacterial meningitis

14. Percentage of patients with severe sepsis or septic shock who received broad-spectrum antibiotics within 4 hours of arrival at the ED

Appendix 2: Databases searched for QCI measurement

Database name	Description
Ariane	
Clinibase	Information system consisting of several integrated modules, including appointment scheduling, admission, care and services management, and specialized modules such as the bed status board, professional activity management and record management. It is designed specifically for hospital centers and multipurpose facilities.
Cortex	NA
Impromptu	NA
MedEcho	Contains data on hospital stays occurred in Quebec hospitals providing general and specialized care.
Med - GPS	Based on the principles of Lean Six Sigma, Med-GPS is a business intelligence solution for data mining and management. Designed with the concept of continuous improvement in mind, Med-GPS allows users to identify areas where clinical and financial performance can be improved, measure actions, and respond quickly to changing trends throughout the care continuum. With its strong business analytics and real-time performance analysis capabilities, Med-GPS allows to identify profitable business solutions and impactful strategies.
MediClinic	A complete electronic health record (EHR) system, including clinical data repository and transactional clinical portal.
MediLabo	NA
MediPatient	Provide full patient record integration, tracking, and reporting. Uniquely identify patients, while supporting multiple records, search a master patient index (MPI), share patient information securely across public and regional health facilities, and create an appointment system to view physician availability at a glance.
Radimage	Radimage is a robust radiology information system that enables healthcare organizations to streamline workflow processes in radiology, electrophysiology, endoscopy, hemodynamics, vascular laboratory, respiratory physiology and other departments.
RQSUCH	
SIURGE	Integrated emergency management system that features a

Database name	Description
	triage module.
Stat - Dev	NA
Stat – Urg	Stat-Emergency is a technological solution that speeds up the decision-making process. Its quick accessibility to files and profiles of emergency patients can reduce costs and save valuable time, which benefits nurses, physicians, administrators and ultimately patients.
Syphac	Syphac is an advanced pharmacy information system that allows clinicians to efficiently follow the entire medication cycle while enabling clinical decision suppor
Med - Urge	As a high-performance software application developed by and for clinical experts (ED nurses and doctors), Med-Urge fully supports, in real time, all aspects of patient care in emergency departments, is easy to use and is evidence based. Med-Urge supports CTAS and CEDIS requirements with straight forward algorithms and treatment pathways suitable for assessing common complaints. This application meets the needs of every emergency department including adult and pediatric ED, fast tracks, walk-in clinics and urgent care centers, community hospitals, teaching hospitals, enterprise/multi-location hospital emergency departments and trauma centers
Others	NA

Appendix 3: List of Quebec's rural hospitals and region

Rural hospitals of Quebec	Regions of Quebec
Centre hospitalier d'Amqui	01
Hôpital de Notre-Dame-du-Lac	01
Centre Notre-Dame de Fatima	01
Hôtel-Dieu de Roberval	02
Hôpital de Baie-Saint-Paul	03
Hôpital de La Malbaie	03
Centre hospitalier d'Asbestos	05
Centre hospitalier du Granit	05
Hôpital de Maniwaki	07
Centre hospitalier du Pontiac	07
Centre hospitalier La Sarre	08
Pavillon Sainte-Famille	08
Point de services de la Minganie	09
Pavillon les Escoumins	09
Point de services de la Basse-Côte-Nord	09
Point de service de Chibougamau	10
Centre hospitalier de l'Archipel	11
Hôpital de Maria	11
Hôpital de Ste-Anne-des-Monts	11
Hôpital de Chandler	11
Hôpital Hôtel-Dieu de Gaspé	11
Hôtel-Dieu de Montmagny	12
Centre de services de la Rivière-Rouge	15
Hôpital de Mont-Laurier	15
Centre hospitalier Laurentien	15
Hôpital Barrie Mémorial	16