

A consensus-based process to define standard national data elements for a Canadian emergency department information system

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Abstract

Canadian hospitals gather few emergency department (ED) data, and most cannot track their case mix, care processes, utilization or outcomes. A standard national ED data set would enhance clinical care, quality improvement and research at a local, regional and national level. The Canadian Association of Emergency Physicians, the National Emergency Nurses Affiliation and l'Association des médecins d'urgence du Québec established a joint working group whose objective was to develop a standard national ED data set that meets the information needs of Canadian EDs. The working group reviewed data elements derived from Australia's Victorian Emergency Minimum Dataset, the US Data Elements for Emergency Department Systems document, the Ontario Hospital Emergency Department Working Group data set and the Canadian Institute for Health Information's National Ambulatory Care Reporting System data set. By consensus, the group defined each element as mandatory, preferred or optional, and modified data definitions to increase their relevance to the ED context. The working group identified 69 mandatory elements, 5 preferred elements and 29 optional elements representing demographic, process, clinical and utilization measures. The Canadian Emergency Department Information System data set is a feasible, relevant ED data set developed by emergency physicians and nurses and tailored to the needs of Canadian EDs. If widely adopted, it represents an important step toward a national ED information system that will enable regional, provincial and national comparisons and enhance clinical care, quality improvement and research applications in both rural and urban settings.

RÉSUMÉ

Les hôpitaux canadiens colligent peu de données à leurs départements d'urgence (DU) et la plupart n'arrivent pas à dresser le bilan de l'ensemble des cas reçus, des processus de soins, de l'utilisation des ressources ou du devenir des patients. Une banque de données nationale normalisée pour les DU faciliterait la prestation des soins cliniques, améliorerait la qualité et la recherche aux niveaux local, régional et national. L'Association des médecins d'urgence du Canada, l'Affiliation nationale des infirmières et infirmiers d'urgence et l'Association des médecins d'urgence du Québec ont créé un groupe de travail conjoint dont l'objectif était de mettre sur pied une banque de données nationale normalisée pour les DU qui réponde aux besoins d'information des DU canadiens. Le groupe de travail a passé en revue les éléments de données provenant du *Victorian Emergency Minimum Data Set* de l'Australie, le document du *US Data Elements for Emergency Department Systems*, la banque de données du *Ontario Hospital Emergency Department Working Group* et la banque de données du *Système national d'information sur les soins ambulatoires* de l'Institut canadien d'information sur la santé. Par consensus, le groupe a défini chaque élément comme étant soit obligatoire, recommandé ou optionnel et a modifié les définitions des données

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pour ajuster leur pertinence au contexte du département d'urgence. Le groupe de travail a identifié 69 éléments obligatoires, 5 éléments recommandés et 29 éléments optionnels représentant des paramètres démographiques, cliniques, de processus et d'utilisation. La banque de données du Système d'information sur les départements d'urgence canadiens constitue un projet réalisable et pertinent adapté aux besoins des DU canadiens et élaboré par des médecins et des infirmières et infirmiers d'urgence. Si son adoption devient répandue, ce système représentera un pas important vers la mise en place d'un système national d'information sur les DU qui permettra de faire des comparaisons aux niveaux régional, provincial et national et facilitera la prestation des soins cliniques, améliorera la qualité et les applications de la recherche tant en milieu rural qu'urbain.

Key words: informatics, emergency department, information system

Introduction

Information gathering is a new prime directive in health care.¹ Valid health care data enhance clinical care, research and quality improvement.² Canadian hospitals collect extensive inpatient data, including demographics, diagnoses, case mix, lengths of stay (LOS), procedural data, physician and insurer information. However, hospitals gather few emergency department (ED) data; hence, most EDs cannot track nor describe their case mix, care processes, work loads, utilization, efficiency or outcomes.³ Too few physicians have easy access to the data that would help them care for patients, and the lack of data impedes clinical care, administration and research.⁴ More importantly, in this age of department closures and care regionalization, policy-makers must make important decisions affecting communities and hospitals without meaningful emergency care information.

In Canada, there have been at least 2 attempts to establish ED data sets. The Ontario Emergency Patient Information System Project, an attempt to collect comprehensive ED data, failed because of a lack of input from emergency physicians and nurses, limited relevance to ED end-users, a difficult, labour-intensive data collection process, inadequate funding and poor data management.^{5,6} The Canadian Institute for Health Information (CIHI) is currently developing the National Ambulatory Care Reporting System (NACRS),⁷ which will harvest data from EDs, hospital clinics and other outpatient care settings. Unfortunately, NACRS is not specifically ED focused, has no representation from national emergency care organizations, and is being developed with limited input from emergency physicians, nurses, researchers and administrators. As a result, it fails to address many of the needs of Canadian EDs.

Many EDs are developing individual data collection systems, but, without coordination, they are likely to establish different data sets and conflicting data definitions.⁸ Resulting variations in the way that ED data are defined and captured will limit their future utility.⁹ A standard national ED data set

that is feasible, relevant and accessible to its end-users — emergency providers, researchers and administrators — would enhance clinical care, quality improvement and research at a local, regional and national level. With this in mind, the National Emergency Nurses Affiliation (NENA), l'Association des médecins d'urgence du Québec (AMUQ), and the Canadian Association of Emergency Physicians (CAEP) established a joint working group on ED information systems (EDISs). The working group's current objective is to develop a comprehensive national ED data set that will facilitate clinical care, research and ED management. The objective of this article is to describe the development process, to present a preliminary ED data set and to solicit feedback from the Canadian emergency community.

Methods

After identifying the need to develop a national ED information strategy, the CAEP Board of Directors invited members of its National Committee on ED Information Systems to devise and initiate a collaborative, consensus-based process for doing so. Committee members contacted emergency physicians known to be active in the field of ED informatics and data management. This group, along with representatives NENA and AMUQ, and any interested CAEP members, were invited to a preliminary Canadian ED Information System (CEDIS) meeting at the CAEP annual scientific assembly in March of 2001. At the preliminary meeting, attendees agreed that the first priority was to define standard ED data elements to be gathered by Canadian EDs. The group also agreed that it was important to have representation from nurses, pediatric and adult clinicians, researchers and administrators from all regions of the country and from large and small hospitals.

The HEDWG data set

Over a 1-year period, the Hospital Emergency Department Working Group (HEDWG), a collaboration of 10 Ontario

ED directors, nurse managers and information technology (IT) experts, systematically reviewed Australia's Victorian Emergency Minimum Dataset (VEMD),¹⁰ the US Data Elements for Emergency Department Systems (DEEDS) document^{7,9} and CIHI's NACRS data set.⁷ From these, they compiled a standardized minimum data set for electronic ED tracking and information systems that contains all of the mandatory NACRS elements (Dr. Michael Murray, "ER Data Elements 2000" Hospital ED Working Group HEDWG in RFP for an Enterprise — Wide ED Information and Patient Tracking System: personal communication, Nov 14 2000). In May 2001, the HEDWG data set was forwarded to members of the CEDIS working group for review, and in June 2001 the working group met in Toronto to derive a preliminary Canadian ED data set that met the needs of all participating groups.

Data elements

The working group formed 3 subcommittees, which reviewed 132 data elements in the following domains: demographics, processes, clinical elements and utilization. By consensus, each data element was placed in one of 3 categories, using the following definitions:

1. **Mandatory data element:** Mandatory elements reflect critical emergency care processes and are considered vital for all EDs to collect, regardless of whether electronic collection is currently possible. If broad consensus in the emergency community can be achieved, these elements will ultimately become a national standard.
2. **Preferred data element:** Preferred elements are desirable, but unless departments have the capability to capture them electronically, collection costs may exceed the potential benefits.
3. **Optional data element:** Optional data elements are relevant to emergency care but of limited interest. Individual hospitals or regions may elect to collect these data based on local funding, EDIS capability and regional research or administrative interests.

Dissemination, feedback and revision

Working group members will communicate the preliminary CEDIS data elements to their constituencies, including emergency nurses, pediatric and adult emergency physicians, researchers and ED administrators. The preliminary data set will be published to solicit stakeholder feedback. National and provincial emergency care organizations will be asked to endorse and promote it. Based on the outcome of this consultative process, the CEDIS document

will be modified and disseminated as a national emergency care position paper.

Results

Table 1 summarizes the data elements included in the NACRS and HEDWG data sets, contrasting these to the new recommendations of the CEDIS working group. The working group identified 69 mandatory elements, 5 preferred elements and 29 optional elements, representing demographic, process, clinical and utilization measures. Of the mandatory elements identified, 46 are not currently mandated in the NACRS data set, including transfer information, mode of arrival, ambulance call number, type of ED visit, patient name, age, language, chief complaint, arrival and triage times, times seen by nurse and physician, care provider, lab and imaging times, as well as times of consultation, disposition and departure. Concurrently, 5 mandatory NACRS elements were eliminated and several definitions were modified to make them relevant to the ED setting (Appendix 1 and Table 2).

Of the new elements added by the working group, 21 were time points, including arrival time, triage time, time seen by nurse, time seen by physician, time consultant called and responded, admission decision time, ED departure time, and ED length of stay. The working group agreed that, because patient registration may be delayed substantially after arrival, arrival time, registration time and triage time should be considered mandatory elements reflecting patient access to care.

Group members from across the country expressed unanimous concern about time delays and ED bed utilization related to the consultation process. As a result, new mandatory fields reflect the times that consultants are called, answer, arrive and make disposition decisions. Ten new process measures, not previously mandated by NACRS, describe laboratory and imaging turn-around times, while new transfer and arrival elements will provide important prehospital care information and facilitate linkages between ED and emergency medical services databases.

Appendix 1 provides basic descriptions of the proposed mandatory CEDIS data elements. Several NACRS definitions required modification to make them relevant to the ED setting. Some NACRS elements, like "type of visit," which consisted of 4 options (first visit for this problem, subsequent visit for this problem, end visit for this problem, and unknown), were not relevant to the ED setting. Because only CIHI can change NACRS definitions, such elements were eliminated from the CEDIS mandatory data

set and replaced by new elements with more relevant definitions and descriptors. To illustrate, NACRS “type of visit” was replaced by the CEDIS “type of ED visit,” which includes 8 options based on the VEMD (Table 2).¹⁰

New CEDIS time elements will enable tracking of patient access to care, department efficiencies, process markers and waiting intervals. The *Canadian Emergency Department Triage and Acuity Scale* (CTAS) triage level¹¹ and chief complaint fields (the latter based on a defined list of presenting complaints now under development) will serve as key determinants of Canadian ED case-mix groups.³ Care provider identifiers will allow ED directors and patient care leaders to link aggregate case mix, utilization, procedure and outcome data to specific practitioners. This will be important to identify practice variability, and to target educational and quality improvement initiatives. The CEDIS modification of “anesthetic technique” as a mandatory ED data element reflects the growing importance of ED procedural sedation to enable outpatient rather than hospital-based procedures.

Discussion

The imperative for ED data collection is clear. EDs are the interface between hospital and community and the access

point for most hospital admissions.³ In recent years, budget cutbacks, bed closures and overcrowding have forced EDs to treat more high acuity patients with less available resources. Ironically, few Canadian EDs can document these fundamental changes because they lack basic case mix, process and utilization data. The ability to define our collective problems, to make reasoned arguments for appropriate ED funding and control, and to improve emergency care delivery will depend on the availability of good information.¹

There is growing belief in the need for comparative standards and benchmarks in health care.⁴ A standard national ED data set will enable regional, provincial and national comparisons, for evaluation, quality improvement and research applications in both rural and urban settings.^{1,4} If Canadian emergency care providers can agree on a national ED data set, we can influence the decision-makers who decide tomorrow’s information needs and the software vendors who develop future information systems.

ED information systems should capture patient demographics, socioeconomic descriptors, triage acuity levels, presenting complaints and ED diagnoses. They should provide critical process data, including waiting times for nurses, physicians and ED stretchers, as well as delays from admission to ward transfer.⁷ They should generate in-

01	Emergency visit	The visit results from a condition that has not been treated in any ED or hospital within 72 hours.
02	Return visit: planned	A planned visit that results from a previous ED visit at the same facility within 72 hours. This may be for planned follow-up care or it may be the consequence of test results that indicate the need for further related treatment.
03	Return visit: unplanned	An unplanned visit within 72 hours of being treated in any ED or discharged from an inpatient hospitalization or day surgery.
04	Outpatient clinic	A planned visit to a hospital- or ED-based office or clinic, where an appointment has been made.
05	Privately referred and treated	The patient is referred to the ED by a private physician or specialist, and treated in the ED by the same practitioner. The visit is usually pre-arranged and is not intended to involve the ED physician.
06	Referred to ED physician	The patient is referred by a physician in a clinic, office or outpatient setting, to see the ED physician for consultation.
07	Referred to other physician	The patient is referred by a physician in a clinic, office or outpatient setting, for another specific consultant or service to evaluate.
08	Pre-admission, clerical, nursing	The patient has come to the ED for a pre-arranged direct admission or for clerical, nursing or medical procedures to be carried out.
09	Patient in transit	The ED is asked to care for a patient awaiting transport to another institution.
10	DOA	The patient is already dead at the time of arrival in the ED.
11	Telehealth or telephone triage	The patient was referred to the ED after a telephone conversation with a doctor or nurse, or after a telehealth consultation.

formation regarding admission rates and resource utilization, stratified by care provider and case mix group, and they should be capable of generating standard reports to monitor department performance.¹ It is critical, however, that, whatever data are collected, they are relevant and accessible to those who need them — emergency care providers.

The CEDIS project, a collaborative effort of nurses, clinicians, researchers and administrators from large and small hospitals in all regions of Canada, is an attempt to ensure that data gathered in Canadian EDs is relevant and accessible. Other groups, both outside^{7,9,10} and inside Canada¹² have developed ED data sets, but we believe the CEDIS model is the most suitable for Canadian needs. Canada differs from other countries in terms of prehospital care systems, triage classification, injury surveillance mechanisms, provider types, and hospital and diagnostic resource availability; therefore, we have different information requirements.

The US National Center for Injury Prevention and Control has developed and published the DEEDS data set.⁷ DEEDS is perhaps the most comprehensive ED data system, but few Canadian departments have the IT and data collection resources to gather more than a fraction of its recommended elements. In addition, many of the elements specified in the DEEDS document are of little relevance in our single-payer, not-for-profit system.

The mission of the CIHI is to maintain a comprehensive health database to help health care leaders make informed decisions.¹³ As part of this mandate, CIHI has copyrighted the NACRS ED minimum data set, which they hope to establish as a Canadian ED standard.¹² Unfortunately, there are problems associated with doing so. The CIHI (NACRS) focus is ambulatory care, not emergency care. The NACRS data set lacks many elements critical to emergency care providers, and many NACRS data definitions do not make sense in the ED context. CIHI has a tenuous relationship with emergency nursing and emergency medical organizations, and did not seek input from either national organization when developing NACRS. The emergency community has limited influence over what CIHI views as necessary ED data, and if CIHI houses and manages ED data, it is not clear what access will be granted and how costly or difficult that access will be. Working group members noted that, despite working in CIHI-affiliated hospitals, they were required to pay for limited access to their own data.

The working group recognizes CIHI's central role in health information. As such, we believe it is critical to collaborate. For that reason, the proposed CEDIS data set includes all core NACRS elements, and the working group,

on behalf of our national organizations, intends to provide CIHI with ongoing feedback regarding important ED elements and definitions, so there are no major discrepancies between the two systems. However, while collaboration with CIHI is important, the CEDIS working group also feels that loss of the ability to determine ED information needs, to define ED data elements and to access critical data would be disastrous. Consequently, we believe the CEDIS data set proposed in this document offers the greatest potential to improve clinical care, ED management and emergency health services research.

Ongoing work

In addition to the ED data set, CEDIS committee members are developing a data dictionary and a structured list of common ED chief complaints, based on systems already in use in Montreal, Edmonton and Vancouver. These explicit chief complaints will ultimately be linked to CTAS triage levels to help define reliable ED case mix groups. The chief complaint list and data dictionary will soon be published on the CAEP and other organizational Web sites.

Members debated the importance of collecting standard screening and prevention elements (e.g., domestic violence, falls in elderly), as well as quality outcome measures such as patient pain and symptom relief, rates of corticosteroid prescription for discharged asthmatics and door-to-drug times. Some of these elements will appear in a future revision.

Limitations and future questions

Cost

Data collection is expensive, and neither CEDIS nor CIHI can mandate or fund the process. For the foreseeable future, hospitals will remain responsible for their own ED information systems, and different hospitals will provide different levels of support for EDIS development. The working group recognizes that many departments are unable to collect what we have defined as mandatory elements. This does not, however, detract from their value. For this reason, the working group decided that mandatory designation should not depend on current ability to gather the elements. During the next 5 years, Canadian EDs will become increasingly electronic. As they do, capturing important data elements — particularly electronic time stamps — will become automatic. The CEDIS goal is not to insist that all EDs capture our mandatory data elements by a particular date, but rather to establish a standard national data set so that, as EDISs evolve, they do so in a convergent rather than divergent fashion, striving for the

same information goal, albeit at different rates.

The ability of EDs to meet their data needs will ultimately depend on the dedication of ED staff and their ability to convince IT departments, hospital administrators and regional boards of the value of these systems. Broad national and provincial support from CEDIS, CAEP, NENA, AMUQ and affiliated emergency care organizations may influence governments and regional boards to provide the necessary funding for information system development, and ED directors can assure their administrators that the CEDIS data elements include all mandatory NACRS elements. When attempting to fund their own systems, ED directors should be creative and consider quality improvement initiatives, infrastructure and research grants, multi-disciplinary partnerships and, possibly, government or industry sponsors.

Data management

The ultimate goal may be to develop a national emergency data repository, freely accessible to emergency providers, administrators and researchers via a secure Web-based interface; however, the working group recognizes that infrastructure requirements, personnel costs, privacy concerns, security, and data sharing issues make this a future vision rather than an immediate goal.¹ In the short-term, individual EDs should develop electronic systems and data capture strategies that are feasible in their setting — targeting the CEDIS data elements outlined in this document. Regional, provincial, national and multidisciplinary collaboration is encouraged. In the future, hospital-affiliated research organizations or provincial governments may be willing to house and manage a national ED database. If EDs across the country adhere to a common core data set, then future problems such as data incompatibility and the high costs of collecting, linking, accessing and analyzing data can be substantially reduced.⁹

Conclusions

A standard, relevant ED data set developed by emergency physicians and nurses will enable Canadian EDs to evolve towards a national information system that will facilitate clinical care, research and quality improvement.

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