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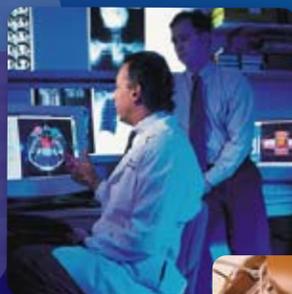


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Frequency, Determinants, and Impact of  
Overcrowding in Emergency Departments  
in Canada: A National Survey of Emergency  
Department Directors



*Supporting Informed Decisions*

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This report and the French version entitled *Relever la fréquence, les déterminants et les répercussions du surpeuplement des urgences au Canada : enquête pancanadienne auprès des directeurs de service d'urgence* are available on CADTH's web site.

This is the third in a series of four CADTH reports on emergency department (ED) overcrowding in Canada. The series looks at measures of ED overcrowding, and examines databases and information systems to monitor the issue. It also examines the frequency, determinants and impacts of overcrowding. Finally, the series explores interventions used to reduce ED overcrowding and reviews which interventions are successful. An overview report on the whole series is available.

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**Canadian Agency for Drugs and Technologies in Health**

**Frequency, Determinants, and Impact of Overcrowding  
in Emergency Departments in Canada:  
A National Survey of Emergency Department Directors**

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May 2006

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Dr. Brian H. Rowe is the guarantor of the study. He contributed to the conception and design of the study, acquisition of data, design of data analysis and interpretation; co-wrote the report; revised it critically for important intellectual content; and approved the final version of the manuscript.

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### **Conflicts of Interest**

Dr. Brian H. Rowe, Kenneth Bond, Maria B. Ospina, Sandra Blitz, Dr. Marc Afilalo, Dr. Sam Campbell, Carla Policicchio, and Dr. Michael Schull disclosed no conflicts of interest.

## Frequency, Determinants, and Impact of Overcrowding in Emergency Departments in Canada: A National Survey of Emergency Department Directors

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### Issue and Methods

Emergency department (ED) overcrowding can be defined as a situation where the demand for emergency services exceeds the ability to provide care in a reasonable amount of time. There is a need to identify the frequency, determinants, and impact of ED overcrowding across Canada. Two hundred and forty-three hospital ED directors in Canadian municipalities larger than 10,000 inhabitants were surveyed on ED overcrowding (158 respondents; 65% response rate).

### Implications for Decision Making

- **ED overcrowding can be defined as a situation where the demand for emergency services exceeds the ability to provide care in a reasonable amount of time.** While definitions vary, most Canadian ED directors surveyed (85%) agreed with this definition.
- **Overcrowding is a frequent and significant problem across Canada.** Sixty-two percent of ED directors reported overcrowding as a major or severe problem in 2004-2005. Major or severe overcrowding is much more likely to occur in EDs with >50,000 visits per year,

communities with a population of at least 150,000, university-affiliated hospitals, trauma centres, and EDs with 30 or more treatment spaces.

- **A lack of beds is thought to lead to overcrowding.** Most respondents (85%) believed that a lack of admitting beds was a major or serious cause of overcrowding. Less than one quarter thought that wait times or staff shortages were a major cause.
- **Overcrowding can impact patients.** Fifty-two percent of responding directors thought that ED overcrowding increased the risk of poor patient outcomes.
- **Overcrowding has implications for human resources.** Most ED directors (82%) perceived that overcrowding had a serious or major negative impact on the level of stress among nurses, nursing staff recruitment and retention (68%), ED staff satisfaction (66%), and increased stress among physicians (65%).
- **Current policies intended to control overcrowding may need to be revisited.** Although 54% of respondents reported that their hospitals have policies to deal with ED overcrowding, 67% thought that they had little or no effect.

This summary is based on a comprehensive health technology assessment available from CADTH's web site ([www.cadth.ca](http://www.cadth.ca)): Rowe BH, Bond K, Ospina MB, Blitz S, Afilalo M, Campbell SG, Schull M. *Frequency, determinants, and impact of overcrowding in emergency departments in Canada: A national survey of emergency department directors.*

# EXECUTIVE SUMMARY

## The Issue

Emergency department (ED) overcrowding can be defined as a situation in which the demand for emergency services exceeds the ability of physicians and nurses to provide quality care within a reasonable time. As the prevalence and severity of this problem have grown in Canada, it has become a health concern. Despite the impact of the problem and an impressive international literature base, the factors behind ED overcrowding in Canada remain poorly understood.

This is the third in a series of four CADTH reports, which together provide a comprehensive assessment of ED overcrowding in Canada

## Objectives

The main objective of this study was to describe the frequency, determinants, and impact of ED overcrowding in Canada. Secondary objectives were to explore the views and perceptions of ED directors about their facility's state of overcrowding; to determine whether there are differences in frequency, determinants, and impact of overcrowding in EDs in Canada; and to explore the potential association between overcrowding and site characteristics.

## Methods

In this national cross-sectional survey, the target population consisted of ED directors of hospitals located in Canadian municipalities with a population of >10,000 inhabitants. The authors developed and pre-tested a 54-item survey in English and French, using standard techniques. Two formats were used: a web-based survey distributed via an automated e-mail system, and a paper survey distributed by post. Data were summarized as percentages for categorical variables. Continuous data were reported as means with standard deviations (SD), or as medians with interquartile ranges (IQR), when appropriate.

## Results

Of the 243 directors who were sent the survey, 158 completed it (65% response rate). Overcrowding in their facilities was seen as a major or severe problem during the past year, by 62% of responding directors. At least one daily episode of overcrowding occurred in 35% of directors' departments in the last three months, and 35% reported the problem occurred at least once daily during the last three months. Most ED directors (85%) thought that overcrowding could be characterized as "a situation where the demand for emergency services exceeds the ability to provide care in a reasonable amount of time." The median cut-off for a "reasonable" length of time to see a physician was 120 minutes (IQR 60, 120). Of ED directors responding to the survey, 85% attributed overcrowding to lack of admitting beds, a lack of acute care beds (74%), the increased length of stay of admitted patients in the ED (63%), the increased complexity and acuity of patients' symptoms (54%), and the occupancy rate of ED stretchers (52%). Most of the directors (82%) perceived that ED overcrowding increased stress among nurses and made the recruitment and retention of nurses more difficult (68%). Overcrowding was also perceived as having a major or serious impact on ED waiting times (79%), the boarding of admitted patients in the ED while waiting for beds (67%), ED staff satisfaction (66%), and stress among physicians (65%). Furthermore, 51% of directors perceived that ED overcrowding has a

major or serious impact on the number of patients who leave without being seen (LWBS). The impact was also perceived in the delays for improving patients' physical, emotional, and mental well-being (54%), and in the risk for poor outcomes (52%).

## **Conclusions**

The results of this study suggest that ED overcrowding is a significant and frequent problem across Canada. It is not limited to large urban centres, nor is it limited to academic and teaching hospitals. Most ED directors perceive access block or an insufficient number of in-patient beds to be the main cause of overcrowding. They perceive that overcrowding lowers the quality and accessibility of emergency care, and increases the stress levels and turnover of ED staff. These perspectives on the problem reinforce the need for more research regarding effective policies and interventions to reduce ED overcrowding.

# ABBREVIATIONS

CAEP	Canadian Association of Emergency Physicians
CTAS	Canadian Triage and Acuity Scale
ED	emergency department
EIP	emergency department occupied by in-patients
ICU	intensive care unit
IQR	interquartile range
LWBS	left without being seen
NENA	National Emergency Nurses Affiliation
SARS	severe acute respiratory syndrome
SD	standard deviation
TEP	technical expert panel

# GLOSSARY

**Access block:** situation where patients in the emergency department requiring in-patient care are unable to gain access to appropriate hospital beds within a reasonable time

**Ambulance diversion:** rerouting of ambulance(s) from the intended receiving facility to an alternative receiving facility, because of a temporary lack of critical resources in the intended receiving facility

**Emergency department gridlock:** simultaneous ambulance diversion at multiple emergency departments

**Boarding of patients:** patients in the emergency department who require in-patient care are held in the emergency department because there are no appropriate hospital beds

**Critical care bypass:** hospital cannot admit one more critically ill patient without compromising the care of patients already in the department (emergency department is essentially closed to patients arriving by ambulance)

**Interquartile range:** measure of statistical dispersion that indicates the range of the middle 50% of the observations (i.e., the range between the 25<sup>th</sup> and 75<sup>th</sup> percentiles)

**Likert scale:** type of ordinal rating scale measuring the strength of agreement with a statement

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# 1 INTRODUCTION

## 1.1 Background

One of the most challenging issues facing the Canadian health care system is overcrowding in hospital emergency departments. Although first described in the US, emergency department (ED) overcrowding has become routine in many countries with socialized health care and extensive primary care networks. Overcrowding can be defined as a situation in which the demand for emergency services exceeds the ability of physicians and nurses to provide quality care within a reasonable time.<sup>1</sup> The criteria that have been used to define overcrowding include boarding of patients in the ED, large ED volumes, long waiting times for patients before being evaluated,<sup>2</sup> excessive ratios of patients to health care providers,<sup>3</sup> provision of treatment in makeshift examination areas (e.g., triage areas and hallways), patients leaving without being seen (LWBS),<sup>4</sup> ambulance diversion, and ED gridlock.<sup>5</sup>

ED overcrowding has a myriad of negative effects on quality of care, patient satisfaction, and other patient-related outcomes.<sup>6-8</sup> Evidence from studies conducted in the US indicates that a significant proportion of cases of morbidity and mortality are due to delays in diagnosis and treatment occurring in the ED, and ED overcrowding has been cited as a contributing factor in 31% of these cases.<sup>9</sup> ED congestion may also contribute to the spread of communicable diseases such as influenza, tuberculosis, and pneumonia. ED congestion was a contributing factor to the disturbing consequences of the severe acute respiratory syndrome (SARS) in many parts of the world, particularly in Toronto.<sup>10</sup>

The effects of ED overcrowding on health care providers are infrequently studied, yet they are not inconsequential. Overcrowding leads to decreases in physician productivity,<sup>7</sup> staff morale, and satisfaction, which may contribute to the loss of talented, highly trained individuals at the peak of their clinical, academic, and administrative careers. Medical errors have also become an issue in the frenetic environment of the overcrowded ED.<sup>7,9</sup> The stress created by overcrowding may result in miscommunication, and transcription and documentation deficiencies.

As the prevalence and severity of problems associated with overcrowding have grown, so has the number of descriptive reports and surveys documenting the frequency, determinants, and impact of ED overcrowding. National surveys of ED directors in the US have gathered evidence about the extent of overcrowding, the type of EDs most affected, the perception of causes, and the adverse effects.<sup>6,7,11-24</sup> The problem of overcrowding has also been described in Australia, the UK, Spain, and Taiwan.<sup>25</sup>

ED overcrowding has become a focus of public concern in Canada. Though rarely reported in the 1980s,<sup>26</sup> once the restructuring and regionalization of the Canadian health care system reached its peak in the mid to late 1990s, overcrowding was recognized as the most significant problem facing emergency care providers.<sup>27</sup> Across Canada, there has been an increase in the number of patients held in EDs as a result of economic pressures, hospital bed closures, and shifts away from acute care. In Ontario, for example, there was a 22% decrease in acute-care beds and an

increase in ED occupancy from 85.6% in 1994-1995 to 93% in 1999-2000.<sup>28</sup> Similarly, Boyle *et al.*<sup>26</sup> reported that EDs in Québec often experienced overcrowding, resulting in long patient waiting times, ambulance diversions, and dissatisfaction among patients and physicians.

Consequently, the Canadian Association of Emergency Physicians (CAEP) and the National Emergency Nurses Affiliation (NENA) released a joint position statement in 2001. They recognized overcrowding as a national issue that was not a result of temporary spikes in ED visits, but one that represented a broader failure in the health care system<sup>1</sup> and that required a coordinated national approach.

## **2 THE ISSUE**

ED overcrowding can be defined as a situation in which the demand for emergency services exceeds the ability of physicians and nurses to provide quality care within a reasonable time. As the prevalence and severity of this problem have grown in Canada, it has become a health concern. Despite the impact of the problem and an impressive international literature base, the factors behind ED overcrowding in Canada remain poorly understood.<sup>29</sup> Emergency physicians have often discussed the problem, but scientific studies documenting overcrowding in Canadian hospital EDs have rarely been undertaken. A few studies have documented the phenomenon at specific hospitals or cities, but no study has examined the problem at a national level. There is a need to identify the frequency, determinants, and impact of ED overcrowding across Canada.

## **3 OBJECTIVES**

The main objective of this study was to describe the frequency, determinants, and impact of ED overcrowding in Canada. Secondary objectives were to explore the views and perceptions of ED directors about their facility's state of overcrowding; to determine whether there are regional differences in the frequency, determinants, and impact of overcrowding; and to explore the potential association between overcrowding and site characteristics.

## **4 METHODS**

### **4.1 Study Design**

In this national cross-sectional study, the target population consisted of ED directors of hospitals located in Canadian municipalities with a population >10,000 inhabitants. Institutions without a designated ED (e.g., psychiatric and rehabilitation hospitals) were excluded from the study. No restrictions were placed on the size of the institution; for example, a small number of beds in a hospital did not disqualify the ED director from participating.

## 4.2 Sampling Frame and Study Participants

There are no national databases, lists, or registers containing information on all the ED services that are available across Canada. A sampling frame had to be developed using various strategies and data sources. All Canadian municipalities with a population >10,000 (N=410) were identified using the Statistics Canada 2001 census data.<sup>30</sup> Municipalities having local hospitals were identified by searching the web sites of regional health authorities, and Canadian health and medical hospitals directories (N=211). A list of hospitals providing ED services for each municipality was built using the Canadian Health Facilities Directory, the member list for the Ontario Hospital Association, the Hospital News hospital locator, and the yellow pages (N=276). Finally, the names of ED directors were obtained for the list of facilities through electronic searches of the hospitals' and EDs' web sites, searches of the CAEP database of ED directors, and from a database compiled by a Canadian emergency medicine researcher (Dr. Ian Stiell). Hospital administrations and emergency services also supplied contact information for ED directors. The principal investigator and members of the study's Technical Expert Panel (TEP), which included 12 nationally recognized experts in emergency medicine, verified the resulting database using their knowledge of current ED directors. The sampling frame contained 243 ED directors, with 15 directors identified as administrators of >1 ED (Figure 1). E-mail addresses were obtained for 189 participants, and postal addresses for another 54. The study population consisted of 243 ED directors, representing the 276 eligible EDs across Canada.

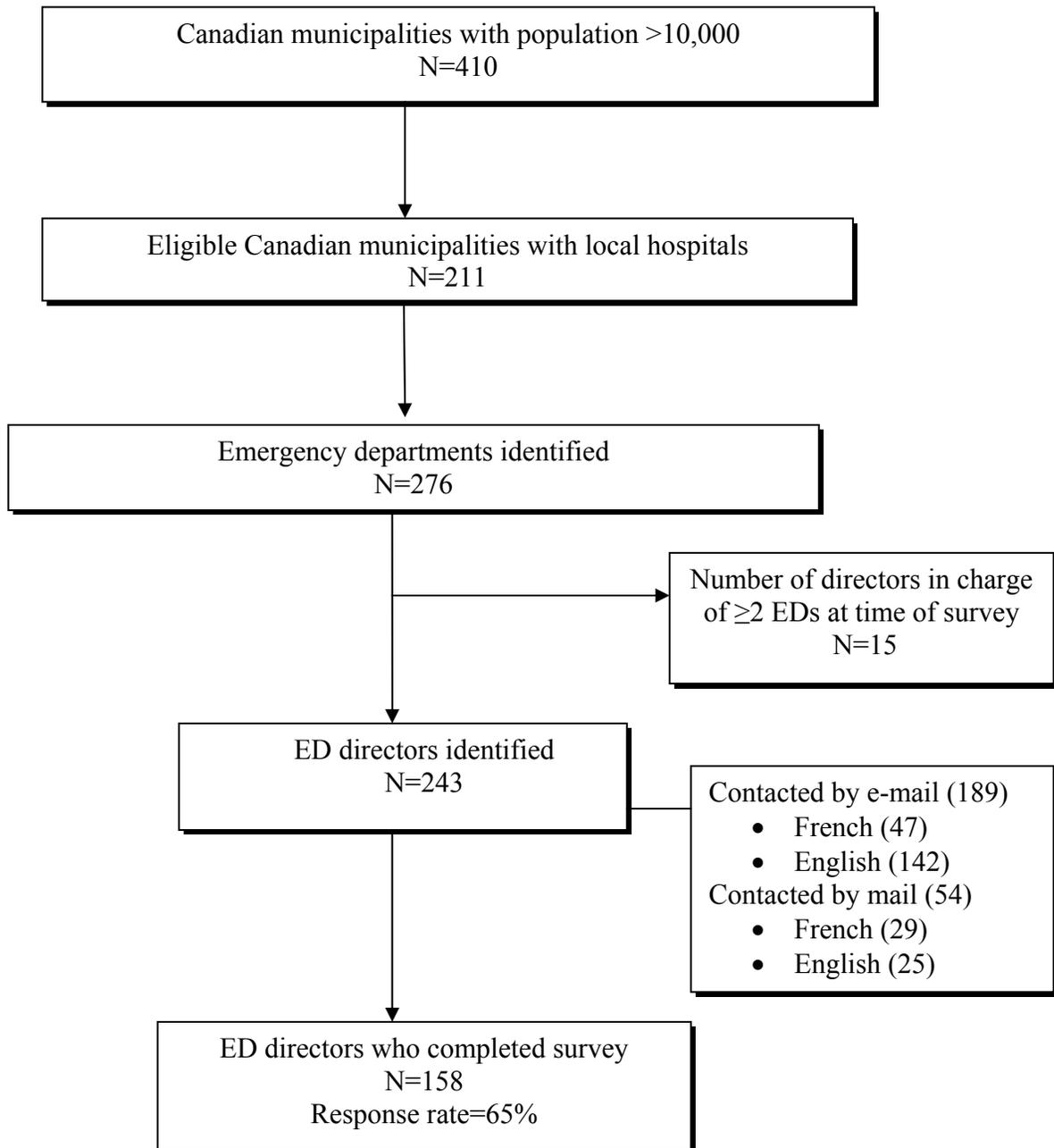
## 4.3 Survey Instruments

The survey questionnaire was developed in four steps between December 2004 and March 2005. First, the content and design of some of the survey questions were developed, based on previous surveys and experts' opinion on ED overcrowding.<sup>7,11,15,16,19,31</sup> These questions were refined and amended in consultation with the TEP.

Next, the survey was pre-tested on a 10% sample of ED directors who were randomly chosen from those available in February 2005, to assess the feasibility, response time, and face validity of the questionnaire. The pre-tested survey took approximately 30 to 40 minutes to complete. No changes in content or structure were made as a result of the pre-test. After another round of discussions with the TEP, the final English version of the questionnaire was generated. A sample of the questionnaire is provided in Appendix 1. The results from the pre-test were included in the final results. Participants in the pre-test phase did not complete a second survey.

The third step was to translate the survey instrument into French and back-translate it into English according to standard procedures described in the scientific literature.<sup>32</sup> The back-translation helped to ensure that the French version of the instrument, a sample of which is shown in Appendix 2, was culturally and semantically equivalent to the original questionnaire. The resulting English and French versions of the questionnaire consisted of 54 questions designed to collect data in eight areas: ED characteristics, frequency of ED overcrowding during the past year, numbers of episodes of ambulance diversion and of boarding of patients over the last three months, ED staffing, definitions of overcrowding used by ED directors, and the perceived causes and impact of ED overcrowding.

**Figure 1: Sampling frame development**



Finally, two formats were devised to deliver the questionnaires: a web-based survey incorporating an automated e-mail system [VS Survey (VSS), developed by VS Communications, Inc.], and a paper survey sent by post. The web-based survey varied from the paper one only in subtle changes of wording to allow for differences in presentation.

## 4.4 Study Protocol

The survey was completed between March and June 2005, with the web-based questionnaire being sent to 189 ED directors (142 English, 47 French). Using the VSS automated system, participants received an e-mail that contained a link to the web site containing the survey, with an introductory letter from CAEP President Dr. Andrew Affleck encouraging physicians to complete the survey. The letter contained details about the study objectives, and funding; and instructions on completing the survey. The bottom of the survey home page contained a link to start the survey, and one to opt out. After completing the survey or opting out, recipients were removed from the list, so that they did not receive reminder e-mails. Respondents were prevented from completing the survey more than once. Directors in charge of >1 ED were asked to provide responses for each ED, or to provide an alternative contact who could complete the survey.

Participants accessed the web survey via standard browsers (such as Netscape<sup>®</sup>, or Internet Explorer<sup>®</sup>). Connectivity was available over secure socket layers, and a 128-bit encryption was used to encode web transmissions. A unique ID was assigned to each participant to track survey responses, but this information was not used to link respondents with their confidential answers. Neither the study investigators nor the members of the TEP had access to the database of respondents and non-respondents. To maximize security, the database of responses was backed up to an off-site location daily, and potential identifiers were removed.

Non-respondents received three automatic e-mail reminders to complete the questionnaire during the survey period (Appendix 4).

Paper surveys were mailed to 54 ED directors (25 English, 29 French) for whom no e-mail addresses could be obtained. Mailed surveys included the cover letter with a pre-paid addressed return envelope. Survey reminders were mailed at one-month intervals after the initial mailing. The data from returned surveys were entered manually into the web-based system at the study coordinating office.

## 4.5 Data Analysis

The survey database was imported to SAS for Windows (Version 8.2; SAS Institute, Cary NC) for statistical analysis. All available data were summarized, regardless of the completeness of an individual survey. Data are reported as percentages for categorical variables. Continuous data are reported as means with standard deviations (SD), or as medians with interquartile ranges (IQR), if appropriate.

## 4.6 Ethics

This study complied with the regulations of the Health Research Ethics Board of the University of Alberta regarding investigations involving human participants. Consent to participate was assumed if the questionnaire was completed and returned.

## 5 RESULTS

At the close of data collection, 158 responses were obtained from 243 ED directors who were sent the survey (65% response rate). The provincial response rates are tabulated in Appendix 5. Most respondents (77%) completed the English version of the questionnaire, whereas 23% completed the French version. A majority (57%) used the web-based instrument, and 43% returned the questionnaire by mail (Appendix 5).

Most ED directors who completed the survey were from Ontario (38%) or Québec (27%). The distribution of the remaining ED directors was British Columbia 11%, Alberta 11%, Nova Scotia 4%, Manitoba 4%, Saskatchewan 2%, New Brunswick 1%, Newfoundland and Labrador 1%, and the Northwest Territories 1%. There were no respondents from Prince Edward Island or the Yukon. The territory of Nunavut was excluded, because no municipalities in the territory contain  $\geq 10,000$  inhabitants. The median population of the communities where EDs were located was 150,000 inhabitants (IQR 42,000; 500,000).

### 5.1 ED Characteristics

Most of the hospitals where the EDs were located provided services for adults and children (84%). Hospitals serving exclusively the adult or pediatric populations were less frequently represented (11% and 5% respectively). More than half of the hospitals (60%) were community-based, 22% were affiliated with universities, and 19% were university hospitals. Most hospitals (64%) were not designated trauma centres, and the median number of beds per hospital was 200 (IQR 90, 350). The median annual ED census of hospitals was 40,000 patient visits per year (IQR 30,000; 58,000).

The directors reported a median of 21 standard treatment spaces per ED (IQR 14; 32) for patients to receive care. The median number of other treatment spaces where ED patients might receive care during periods of overcrowding was eight spaces (IQR 4; 15). More than half of the directors (61%) reported that their EDs have a fast-track area, and 44% reported that their EDs have an observation unit.

Most of the ED directors (87%) reported that patients are not triaged to clinical areas that are outside the ED, but are instead referred to treatment areas in the ED. The median proportion of patients seen in the ED and admitted to the hospital was 15% (IQR 10%; 30%).

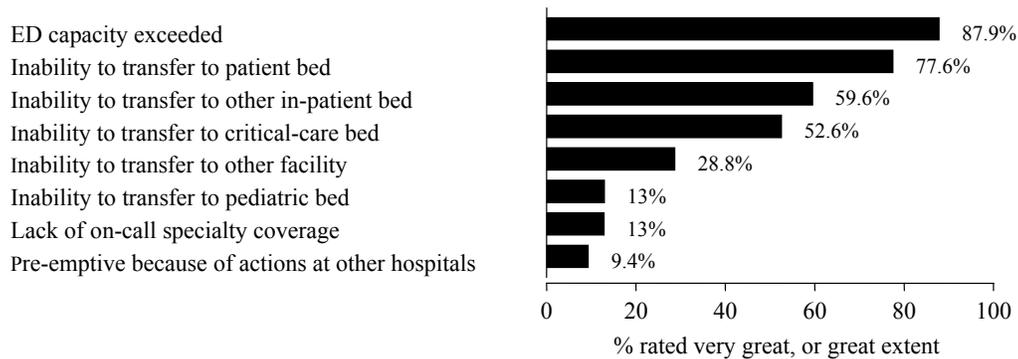
### 5.2 Severity and Frequency of ED Overcrowding

Most (62%) ED directors reported overcrowding was a major or severe problem during the past year with varying degrees of frequency. Overcrowding occurred at least once daily during the last three months according to 35% of directors, whereas 36% said that the problem occurred more than once every week. Although 54% of the respondents reported that their hospitals have policies implemented to deal with ED overcrowding, 67% thought that these policies have little or no effect.

### 5.3 Indicators of ED Overcrowding

The practice by some EDs of diverting ambulances to another ED is believed to be a sign of overcrowding, and has been studied in some provinces in Canada.<sup>33,34</sup> Of the 158 directors who completed the survey, 42% reported that their EDs went on ambulance diversion or critical care bypass during the last three months. Some EDs are not legally permitted to divert ambulances, and others are only allowed to divert certain types of cases. Some have no other hospital ED to which to divert ambulances; 27% of the directors reported that their ED was the only local ED where ambulances can present. Among hospitals where ambulance diversion was possible, 49% of EDs with <50,000 visits per year reported diversion at least once in the past three months compared to 74% of busier EDs. Directors identified several conditions that contributed to their decisions during the last three months to divert ambulances: ED capacity was exceeded (88%), there was an inability to transfer patients to patient beds (78%), or there was a lack of available critical care beds (53%). Figure 2 shows a bar chart of these data.

**Figure 2: Conditions contributing to ambulance diversion**

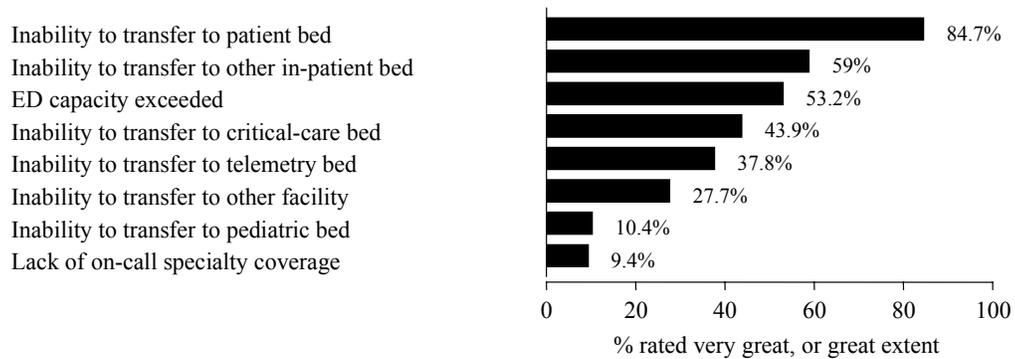


Most directors (76%) reported that their EDs and hospitals are aware of periods when other area EDs are on diversion (i.e., ED gridlock). Almost half of the facilities (46%) use a central electronic diversion program, but directors also reported using the telephone (44%) and word of mouth from ambulance drivers (8%). Most directors (64%) reported that their hospitals lack an administration policy to deal with ambulance diversion when it occurs.

Access block or the boarding of patients has been identified in the literature as an indicator of overcrowding in the ED.<sup>35-38</sup> A median of 13 in-patients (42% of available treatment spaces) were reported to be waiting in the ED (EIP) for a hospital bed during the three months before the survey [IQR 7 (26%), 24 (55%)]. Most directors (85%) reported that at least one admitted patient had received total care in the ED. Directors identified the following conditions that contributed to the boarding of patients in EDs: the inability to transfer patients to an in-patient bed (85%), the inability to transfer patients to other beds (59%), ED capacity exceeded (53%), and the inability to transfer patients to intensive care unit beds (44%) (Figure 3).

The number of patients who left without being seen is another indicator of ED overcrowding.<sup>39-42</sup> ED directors reported that during the last three months, a median of 6% of patients (IQR 2.7, 15.0) completed triage in the ED but left without receiving a medical evaluation.

**Figure 3: Conditions contributing to boarding patients in the ED**



## 5.4 Definitions of ED Overcrowding

The directors were asked to characterize ED overcrowding from a list of scenarios that they believed best defined the problem. Most (85%) considered that ED overcrowding can be characterized as “a situation where the demand for emergency services exceeds the ability to provide care in a reasonable amount of time.” The median cut-off for a “reasonable” amount of time to see a physician was 120 minutes (IQR 60, 120). ED overcrowding was also defined by 82% of the directors as a situation where hallways are filled with patients for longer than a median of one hour per day (IQR 1, 6). Another definition of ED overcrowding, selected by 73% of directors, occurred when accessibility is affected to such an extent that the Canadian Triage and Acuity Scale (CTAS) guidelines were not met. These guidelines refer to the recommended maximum length of time that can elapse before a patient is seen by a physician on presentation to an ED. This varies from immediately for CTAS level 1, to 120 minutes for CTAS level 5.

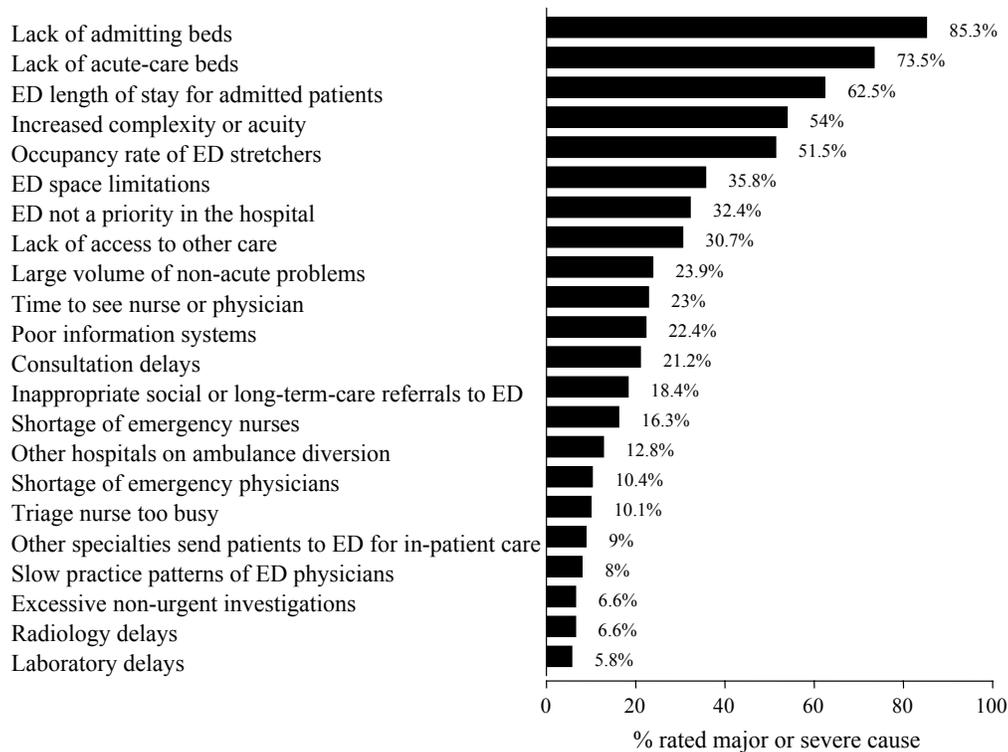
## 5.5 Causes of ED Overcrowding

The directors were asked to rank reputed causes of ED overcrowding on a five-point Likert scale (1=not a cause, 5=severe cause). Among the respondents, 85% thought that the lack of admitting beds was a major or severe cause of ED overcrowding. Other perceived causes of ED overcrowding that were rated as major or severe (Figure 4) included the lack of acute-care beds (beds that are usually designated for acute care, and that are not chronic-care beds) (74%), the length of stay of admitted patients in the ED (63%), the increased complexity and acuity of cases (54%), and the occupancy rate of ED stretchers (52%).

## 5.6 Impact of ED Overcrowding

ED directors estimated the impact that overcrowding has on the ED on a five-point Likert scale (1=no impact, 5=serious impact). Of the ED directors responding, 82% perceived that overcrowding increased stress among nurses, and had a serious or major impact on nursing staff recruitment and retention (68%). Directors also thought that overcrowding had a major or serious impact on ED waiting times (79%), the boarding of admitted patients in the ED (67%), ED staff

**Figure 4: Causes of overcrowding**



satisfaction (66%), and increased stress among physicians (65%). Of the directors who responded, 51% perceived that ED overcrowding has a serious or major negative impact on the number of patients who LWBS; and on the improvement of patients’ physical, emotional, and mental well-being (54%); and increases the risk of poor outcomes (52%) (Figure 5).

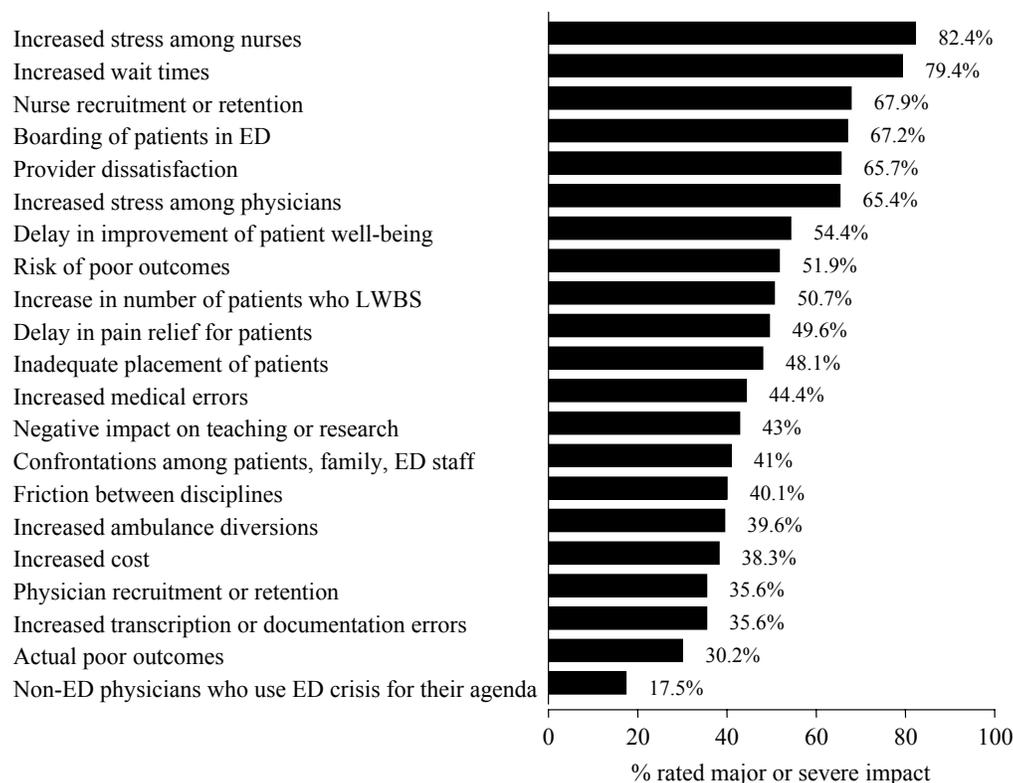
Appendix 5 provides a complete summary of the survey results.

## 5.7 Site Characteristics and ED Overcrowding

A priori, 50,000 visits per year was set as a cut-off point to identify “busy” EDs; 36% of respondents were directors of such EDs. Of these directors, 86% reported overcrowding as a major or severe problem, compared to 49% of those with <50,000 visits per year. The busy EDs were six times more likely to experience major or severe overcrowding than EDs with <50,000 visits.

British Columbia and Alberta reported major or severe overcrowding more frequently, as did larger centres (as measured by community population, ED census, number of hospital beds, and number of treatment spaces in the ED). Communities with a population  $\geq 150,000$  were four times as likely to report major or severe overcrowding as communities with populations <150,000. EDs in university hospitals or university-affiliated hospitals were four times more likely to report major or severe overcrowding as EDs that were self-described as community hospitals. EDs

**Figure 5: Impact of ED overcrowding**

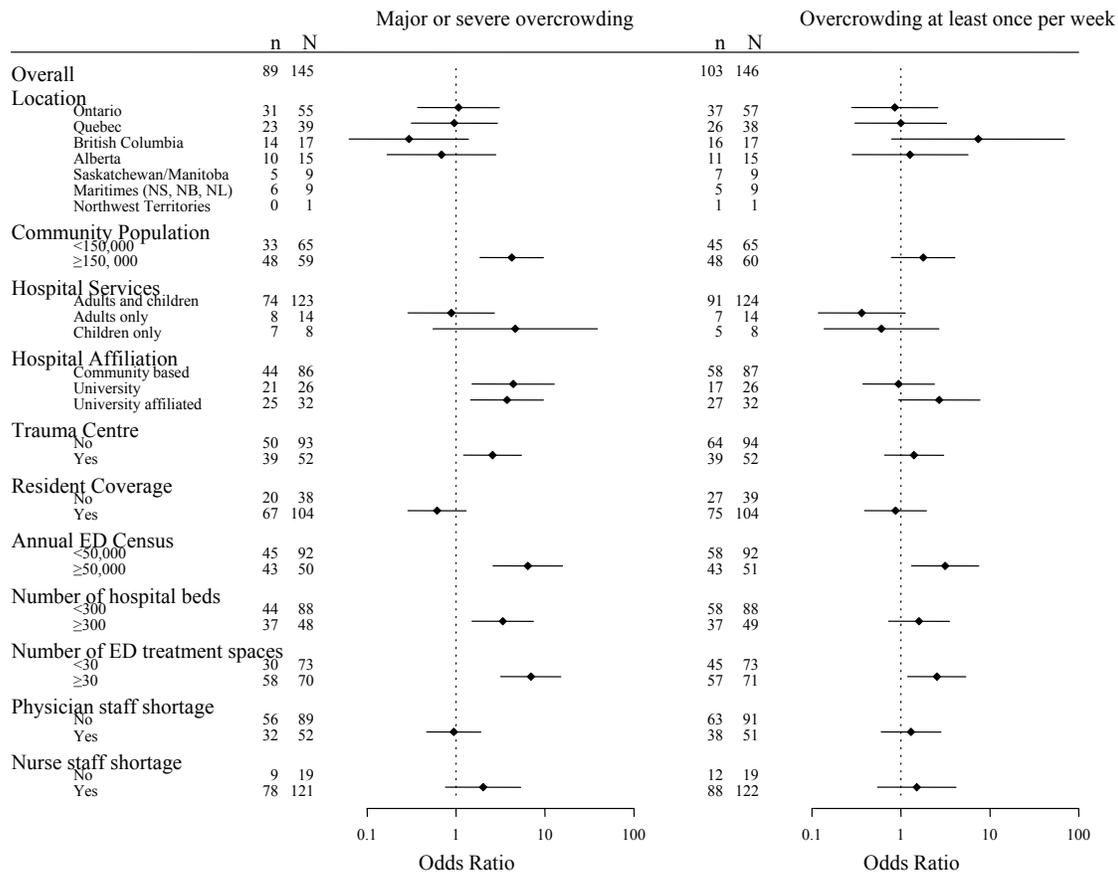


designated as trauma centres were almost three times more likely to report severe or major overcrowding compared with EDs that did not designate themselves as trauma centres. The number of ED treatment spaces was also associated with greater overcrowding. For example, EDs with  $\geq 30$  treatment spaces were seven times more likely to report major or severe overcrowding than EDs with fewer treatment spaces. The severity of overcrowding did not appear to be related to resident coverage or recent shortages in physician or nurse staffing (Figure 6).

Associations between annual ED census, treatment spaces, and frequency of overcrowding were also significant (Figure 6). Busy EDs were three times as likely to report that they were overcrowded at least once per week than EDs with an annual census of  $< 50,000$  visits. EDs with  $> 30$  treatment spaces were  $2\frac{1}{2}$  times as likely to report being overcrowded once per week as EDs with fewer treatment spaces.

Other possible associations between busy EDs and overcrowding were not significant. There was no difference in the number of EDs that reported “admitted” patients receiving all their care in the ED. The median proportion of patients who left before medical evaluation was similar. Finally, regardless of the number of ED visits per year, the directors reported the same leading causes and impacts of overcrowding. Though further analyses were planned a priori, the small number of responding EDs in various regions of the country precluded further exploration of the associations between site characteristics and ED overcrowding. Appendix 6 provides a full description of these results.

**Figure 6: Associations between site characteristics and ED overcrowding**



N=total responders for the question, n=number of cases.

## 6 DISCUSSION

### 6.1 Summary of Results

This survey was sent to 243 ED directors in municipalities across Canada with populations >10,000. The response rate was 65%, with all jurisdictions represented except Prince Edward Island, Yukon, and Nunavut. Most EDs reported providing service for adults and children (84%). More than half of the EDs were located in community hospitals (60%), with a median annual ED census of 40,000 patient visits per year and a median municipal population of 150,000. Most of the directors were located in Ontario and Quebec (65%), the most densely populated regions of Canada.

The results of this survey portray a picture of overcrowding similar to that produced by surveys conducted in other countries with highly populated municipalities and increasing ED attendance. Of the directors who responded to the survey, 62% reported that overcrowding was a major to severe problem during the past year. Of those Canadian ED directors who reported having

policies on overcrowding, 67% reported that the policies were minimally effective or completely ineffective. While the rates of ED overcrowding reported by Canadian ED directors are lower than those in the US, where reports of ED overcrowding hover around 90%,<sup>6,11,16</sup> and nearly all American directors report at least periodic ED saturation,<sup>12-16,19-21</sup> the fact that more than half of the Canadian directors surveyed perceive overcrowding to be a prominent issue in their facility is a cause for concern. A decade ago, the American College of Emergency Physicians (ACEP) reported that <10% of ED directors surveyed were concerned about overcrowding.<sup>43</sup>

The response rate of this survey (65%) is comparable to that of other large-scale ED surveys conducted in the US.<sup>6,11,19,24</sup> Some of the directors may have found the length of the survey prohibitive, but it seems reasonable to assume that the importance of the topic, or “issue salience” of overcrowding for ED directors, would help counter-balance the negative effect of the length of the survey.<sup>44</sup> A 2003 national survey conducted by the US General Accounting Office of >2,000 hospitals achieved a response rate of about 74%, despite the fact that it was 23 pages long. The ED portion of that survey contained 27 questions.<sup>19</sup> A 2002 study of overcrowding in 300 hospitals in New York, Florida, and Texas, reported a response rate of 70%,<sup>11</sup> while a 2001 survey of 836 US ED directors had a response rate of 69%.<sup>16</sup> A 2003 survey that tried to document the perceptions of overcrowding in 250 American EDs obtained a response rate of 36%. Given the wide range of response rates, there may be other factors that discourage or prevent ED directors from completing surveys, even if the issue is highly relevant.

An analysis of the association between the ED census and the severity of overcrowding shows that 86% of EDs with  $\geq 50,000$  visits per year reported overcrowding as a major or severe problem, compared to 49% of those with fewer visits. The US General Accounting Office ED survey also showed that overcrowding was more common in hospitals located in areas with larger populations or those with high rates of population growth.<sup>19</sup> Schneider reported that in a survey of 250 EDs, overcrowding was present in all geographic areas and all hospital types,<sup>24</sup> while Derlet *et al.* reported that EDs serving populations of <250,000 had less severe overcrowding (87%) than EDs serving larger populations (96%).<sup>16</sup> ED directors indicated their perception of the frequency of overcrowding before they were asked to indicate their operational definition of overcrowding. As a result, ED directors may not have used the same criteria when considering the frequency of overcrowding. It can be reasonably assumed that the operational definitions were used when the frequency of overcrowding was considered, but there was no way to verify this.

A survey done in 2002 by the Lewin Group and commissioned by the American Hospital Association found that >90% of large hospitals (300+ beds) report EDs being beyond capacity.<sup>6</sup> In this study, 43% of Canadian hospitals of a similar size reported being overcrowded at least once per day, and 33% reported being overcrowded at least once per week.

The most highly rated causes of overcrowding were the lack of admitting beds (85%). A recent study and an earlier survey lend support to the perception that overcrowding is due to the inability to admit patients. Cooke *et al.* reported that high bed occupancy is associated with a risk of prolonged waits in the ED,<sup>45</sup> and a high proportion of US emergency physicians identified boarding patients in the ED as one of the largest contributors to overcrowding.<sup>18</sup> Other causes that were rated highly by Canadian ED directors were the lack of acute-care beds (beds usually designated for acute care, and that are not chronic-care beds) (74%), the length of stay of

admitted patients in the ED (63%), the increased complexity and acuity of cases (54%), and the occupancy rate of ED stretchers (52%). In the US, overcrowding has also been viewed as the result of boarding patients,<sup>18,19</sup> hospital bed shortage,<sup>11,22,46</sup> too few examination spaces,<sup>11</sup> access block,<sup>47</sup> high patient acuity,<sup>22,46</sup> laboratory delays,<sup>46</sup> and nursing shortage.<sup>46</sup> While space limitations and laboratory delays appear high on the list of causes in the US, 34% of Canadian ED directors reported space limitations to be a major or severe cause of overcrowding (the seventh highest rated cause), and 6% believed laboratory delays to be a major or severe cause.

Most of the directors surveyed perceived that ED overcrowding had a negative impact on stress levels among physicians (65%) and nurses (82%), and on the ability to recruit nursing staff (68%). The proportion of Canadian ED directors who believe that overcrowding has a negative impact on patient outcomes (52%) is higher than the 30% reported by Derlet *et al.*<sup>16</sup> in a survey of US ED directors. The proportion is lower than the 72% reported by Epstein *et al.*<sup>22</sup> for the number of directors who believed that patient care was compromised by overcrowding. The proportion reported here also contrasts with the findings of a 2003 ACEP survey,<sup>18</sup> where 80% of respondents believed that boarding patients had a negative impact on patient safety.

## 6.2 Study Limitations

This survey was based on several assumptions. First, it assumed that ED directors have a good idea about the operation of their department, and the service pressures that their staff face daily.

Second, it assumed that the answers given were truthful; there was no attempt to verify data. In some instances (e.g., ED census and patients who LWBS), estimates were accepted.

Third, it was understood that the results of the survey reflect the subjective perception and opinion of ED directors, and as with previous surveys,<sup>15,19</sup> this may have led to an overestimation of the problem. Although the response rate of this survey is comparable to those of similar surveys,<sup>6,11,19,24</sup> it may reflect potential biases. The effect of a non-respondent bias might have contributed to an overestimation of the problem of ED overcrowding. It is possible that ED directors experiencing overcrowding were more likely to reply, but this assumption was not tested in the analysis, because limited information from the non-respondents was available. Another limitation was the fact that not every ED director answered all the questions.

Fourth, the subjective nature of using a multiple-choice scale with descriptions such as “minimal impact,” “moderate impact,” and “major impact” to measure the determinants and impact of overcrowding was understood. This was noted in a previous survey.<sup>15</sup>

Fifth, the cover letter was deliberately written in a tone of advocacy to motivate busy ED directors to complete the survey. Informing ED directors that completing the survey is “an important step toward resolving the problem” and that it will “provide us with the objective data needed to successfully address the problem of ED overcrowding” is unlikely to have biased the results significantly.

It was hoped that by contacting recipients using a combination of e-mail and paper mail, there would be a high response rate. Relying foremost on e-mail may be partially responsible for the low response rate. Though e-mail surveys may be more cost-effective, their inferiority to postal

mail surveys has been documented.<sup>48,49</sup> The survey length may have caused respondent fatigue, particularly in the latter parts of the questionnaire; longer mail surveys are more likely to have lower response rates.<sup>50</sup> Studies on the effect of questionnaire length on response rates and on quality of data in online surveys have shown that subjective impressions of questionnaire length do not affect response rates<sup>51</sup> as much as the general interest that participants have in the topic.<sup>52</sup> Multiple reminders were sent by post and e-mail to increase the likelihood of response.<sup>48,50</sup> It was also believed that using the current CAEP database would address the pitfall of sending surveys<sup>49</sup> to outdated e-mail addresses.

Developing a sample frame can be difficult, even when the population of interest is a professional organization. The list of members is often dynamic, and may include those who may no longer be active and exclude those who have recently joined. All reasonable effort was made to ensure that the list was current. Otherwise, this may have been a source of bias.

### **6.3 Generalizability of Findings**

With a median municipal population of 150, 000 and a median ED census of 50,000 patient visits per year, the results of this survey are limited to larger centres and hospitals. It was assumed for this study, that there is a lower boundary for a municipal population below which ED overcrowding occurs rarely, if at all. This assumption, however reasonable or intuitive, needs to be supported with evidence. External reviewers of a survey of US hospitals commented about anecdotal information that indicates ED overcrowding is becoming a concern in rural areas.<sup>19</sup>

### **6.4 Health Services Impact**

There may be jurisdictions and EDs across Canada that routinely collect enough data in provincial or national administrative databases to enable them to measure a greater number of indicators than those identified in this report. The inconsistent use of definitions, indicators, and measures of ED overcrowding may create a confusing picture that fails to capture the multi-dimensional nature of the problem in Canada. The measures and indicators presented in this report may help guide the current work to develop uniform ED data collection systems that can track overcrowding across Canada.

### **6.5 Knowledge Gaps**

The findings point to the need for further research to develop a fuller understanding of the problem of ED overcrowding in Canada. Two-thirds of the directors who reported having overcrowding policies believed that these policies were ineffective. Further research into the policies that have been implemented and the aspects that are effective or ineffective would help policy makers and administrators develop potential strategies to address overcrowding.

It is unlikely that single strategies will adequately address the problem of overcrowding across regions. Solutions may need to be tailored to individual sites. There may be similarities between regions, and an understanding of the causes of ED overcrowding that are common to regions may help in the development of provincial and national strategies to address the problem.

## 7 CONCLUSIONS

As with the results of similar studies conducted in the US,<sup>16,19</sup> the results of this study suggest that overcrowding is a frequent and significant problem across Canada. The problem is not limited to large urban centres, nor is it limited to academic and teaching hospitals; larger hospitals, however, appear to suffer disproportionately. Most ED directors perceive access block or the insufficient number of in-patient beds to be the main cause of the problem. They perceive that ED overcrowding lowers the quality and accessibility of emergency care, and increases stress levels and turnover of ED staff. These perspectives on the problem reinforce the need for more research regarding effective policies and interventions to reduce or prevent ED overcrowding.

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## **APPENDICES**

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