

Hospital Emergency Readiness Overview Study

Daniel Kollek, MD, CCFP (EM);¹ A. Adam Cwinn, MD, FRCPC²

1. Associate Professor, Division of Emergency Medicine, McMaster University, Hamilton, Ontario Canada
2. Professor, Department of Emergency Medicine, University of Ottawa; Head, Department of Emergency Medicine, The Ottawa Hospital, Ottawa, Canada

Correspondence:

Daniel Kollek, MD, CCFP (EM)
Associate Professor, Division of Emergency Medicine
McMaster University
4000 Creekside Drive, Unit 902
Dundas, ON L9H 7S9
CANADA
E-mail: kollek@ceep.ca

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Abbreviations:

CAEP = Canadian Association of Emergency Physicians
CBRN = chemical, biological, radiological, or nuclear
HERO = Hospital Emergency Readiness Overview
SARS = severe acute respiratory syndrome

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Abstract

In 2001, a survey of Canadian emergency departments indicated significant deficiencies in disaster preparedness. Since then, there have been efforts on the part of Provincial governments to remedy this situation. This survey repeats the original study with minor modifications to determine if there has been improvement. The Hospital Emergency Readiness Overview study demonstrates that despite improvements, there remain gaps in Canadian healthcare facility readiness for disaster, specifically one involving contaminated patients. It also highlights the lack of any standardized assessment of healthcare facilities' chemical, biological, radiological, or nuclear readiness.

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Introduction

Since the terrorist attacks of 11 September 2001, emergency department staff across North America have become more aware of the need to be prepared to cope with events involving chemical, biological, radiological, or nuclear (CBRN) contaminants in mass-casualty scenarios or in situations involving smaller numbers of victims. Such an occurrence could be due to a terrorist event or an accidental release of toxic chemicals, radioactive substances, or biological agents unrelated to terrorist activity.

In the last quarter of 2001, a study was performed to review the risks and characteristics of these events and to assess the readiness of Canadian emergency departments to respond.¹ Readiness was assessed using a survey, the analysis of which demonstrated a deficiency in readiness—most notably in the availability of appropriate equipment, antidotal therapy, and decontamination capability. There also were significant deficiencies in the ability to respond to a major biological or nuclear event. This is consistent with studies performed in other countries.^{2–5}

Since then, the Canadian Federal and Provincial governments have invested time, money, and efforts to remedy these deficiencies in readiness. In 2007, the Center for Excellence in Emergency Preparedness (CEEP) and the Disaster Committee of the Canadian Association of Emergency Physicians (CAEP) repeated the earlier study to determine if progress has been made. The purpose of this Hospital Emergency Readiness Overview (HERO) study is to assess the readiness of emergency departments in Canada at the organizational and administrative levels. The original questionnaire was modified with input from Federal and Provincial authorities as well as experienced emergency physicians, keeping in mind the limitations of the first study.

Methods

This survey incorporated the questions from the original study,¹ as well as new questions suggested by representatives from the Ministry of Health and Long Term Care of the Ontario Emergency Management Unit, the Public Health Agency of Canada and emergency physicians with experience in disaster management. The questionnaire consisted of multiple-choice questions divided into sections by demographics of the department, risk assessment, general disaster readiness, readiness for bio-events, ability to decontaminate, radiation readiness, and the availability of antidotes.

The CAEP e-mailed the link to an online, web-based survey, as well as a brief introductory letter explaining the purpose of the study to 315 emergency departments across Canada using their e-mail list of Chiefs of Emergency or key contact persons. Two separate, subsequent reminders to complete the survey were sent via the CAEP, and

Annual Emergency Department Census	n (%)
<20,000	9 (26.5)
20,001–50,000	14 (41.2)
50,001–100,000	10 (29.4)
>100,000	1 (2.9)
Type of facility	n (%)
Teaching	11 (32.4)
Community—Urban	14 (41.2)
Community—Rural	7 (20.6)
Undetermined	2 (5.9)

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Table 1—Characteristics of 34 hospitals that participated in the Hospital Emergency Readiness Overview (HERO) study

the online survey link was included with each reminder. One additional reminder, including the survey link, was sent using the e-mail list of the North York Emergency Department Administrators Conference.

The emergency department chief or physician designate was asked to complete the survey and was instructed to ask other hospital personnel for assistance with information when needed. Results were pooled for confidentiality so that data element responses could not be ascribed to an individual hospital. Postal code identifiers were used to ensure that no duplicate entries were analyzed and to determine the distribution of responses by province. Results were collected online and analyzed using Survey Monkey[®] (California, USA) software. The statistical processing included univariate statistical tests as appropriate for the data.

This study was approved by the Research Ethics Board of McMaster University.

Results

Thirty-eight responses were received. Of these, four were duplicate or largely incomplete, leaving 34 (11%) responses for analysis.

Characteristics of the responding hospitals are in Table 1. The majority had an emergency department census between 20,000 and 100,000 patients/year. All provinces were represented (Table 2) except Newfoundland, Prince Edward Island, and Saskatchewan, and there was a slight majority of urban vs. rural departments.

The elements of risk assessment, general disaster preparedness, bio-event preparedness, availability of equipment, and antidote availability in Canadian emergency departments are described in Tables 3–6.

Province	Urban	Rural
Newfoundland	0	0
Prince Edward Island	0	0
Nova Scotia	1	2
New Brunswick	1	0
Quebec	3	2
Ontario	7	5
Manitoba	3	2
Saskatchewan	0	0
Alberta	2	2
British Columbia	2	2
Unknown (1)		
TOTAL	19	15

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Table 2—Representation of hospitals from across Canada that participated in the Hospital Emergency Readiness Overview (HERO) study

All hospitals in this survey and the one performed in 2001 reported that they had a disaster response plan.¹ In the present study, only one-quarter of the hospitals had performed a risk analysis, and of those, more than one-half had not revisited it within the last five years.

The disaster response plan was reviewed within the last three years in 80% of respondents, and 81% in the 2001 study. The emergency department was nearly always involved in the review and, in response to a question not asked in the original survey, only about one-half the responding facilities in this study had coordinated their planning with other organizations. Of respondents to this survey, 17.6% had not been briefed on the disaster response plan for their emergency department.

Sixty-five percent of respondents had performed a tabletop disaster exercise, and 30% a full disaster exercise. The original survey had highlighted that in the past three years, only 40% of hospitals had performed a paper trial (tabletop exercise), and only 4% had performed a full exercise with simulated patients.

Eighty-eight percent of facilities had a reporting protocol for bio-events (increased from 37% in 2001). This marked improvement may reflect Canadian hospitals having experienced the severe acute respiratory syndrome (SARS) crisis. Since establishing such a protocol costs nothing to the individual hospitals, this deficiency is easier to remedy than others.

A new question in this survey asked about the availability of N95 masks, an item that received high profile during the SARS

Question	Response			
	Yes	No	Don't Know	Null
Risk Assessment				
Proximity of ED (within 30 km) to:				
Chemical transport rail or road	9	14	11	
Chemical factory	11	6	17	
Nuclear plant		33		1
General Disaster Preparedness				
Has your facility performed a formal risk analysis using a risk assessment tool?	9	14	11	
Was the risk analysis done within the last 5 years?	9	0	9	16
Does your facility have a disaster plan?	34	0		
When were you briefed on your disaster plan:				
Individually on joining the organization?	5			
As part of routine staff briefing?	23			
Have not been briefed.	6			
Plan was reviewed by hospital disaster committee in previous 3 years.	27	4	3	
Was the ED involved in the review process?	27	2	5	
Plan was trialed on paper or tabletop exercise in previous 3 years	21	7	4	2
Plan was trialed in full exercise with simulated patients in last 3 years	10	19	4	1
Is your Chief of ED involved with other regional agencies for regional disaster planning?	17	15	1	1
In the event of a disaster requiring staff to stay extra hours, does your facility have the ability to:				
Provide sleep areas for staff during breaks?	17	13	4	
Feed staff?	32	1		1
Provide wash areas for staff and to change clothes?	28	3	3	

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Table 3—Disaster preparedness in general (ED = emergency department)

crisis. All of the respondents made these available to their staff, and approximately one-half of the staff had been fit-tested within the past year. A total of 88% had access to supplies in an emergency, and 74% had HEPA-filtered rooms in their respective emergency departments.

Despite the fact that 58% of hospitals recognized that their facility was proximal to a potential chemical spill site, only 38% of the current respondents stocked personal protective equipment

(PPE) in the emergency department, and nearly 15% of those who stock the equipment have not trained within the past year. Only 62% have a chemical decontamination capacity or team and of those, only 38% had a system to contain contaminated runoff fluids.

Only 32% of respondents confirmed having radiation detection equipment, and only 21% had a formal response plan for radiation incidents.

Question	Response			
	Yes	No	Don't Know	Null
Bio-preparedness				
Do you have a protocol in place to report a patient infected with a reportable disease?	30	4		
If you suspected your patient has been deliberately infected, do you have a protocol to report this?	11	14	8	
Are you aware of your hospital plan in the event of a significant bio-event (e.g., flu pandemic)?	30	4		
Does your facility have an infection control officer or equivalent?	34			
If answering Yes, is the infection control officer involved in bed allocation for admitted patients?	9	16	9	

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Table 4—Bio-preparedness

Discussion

The results of the HERO survey indicate that there are important deficits in readiness of the emergency departments that responded, and that no national standards for disaster readiness are reflected by the data.

The concerns about the lack of readiness are exacerbated by the lack of coordination and standards across Canada. The diversity of responses denotes a haphazard response pattern with variability between provinces. Some Federal programs, such as the “METER” course for radiation preparedness, only have been offered a few times in select locations, and have been discontinued (hopefully only temporarily). Some provincial programs have been delivered without coordination between provinces, creating a possible obstacle for future mutual aid, as protocols and equipment might not be interoperable. As such, while individual hospitals may have improved their response capability, it is difficult to speak of “national” healthcare disaster readiness with any degree of accuracy or evidence.

There are a limited number of reports in the literature on the preparedness of emergency departments to handle these events. Anathallée *et al* recently surveyed 257 hospitals in the United Kingdom to assess readiness to manage patients with infectious diseases, and were able to obtain complete data in 79%.² Only 24% had isolation facilities in the emergency department, as opposed to 80% in the HERO study. They also determined if the ventilation system for the isolation rooms was independent, and this question should be added to future surveys in Canada.

Keim *et al* found poor hospital preparedness for chemical terrorism in the United States. There was no significant difference in preparedness detected in surveys conducted in 1996 and 2000 despite investment in resources.³

Greenberg *et al* had an 88.5% response rate to a 38-question survey on biological or chemical terrorism preparedness.⁴ Deficiencies in physician training, antidote stocking, interagency agreements, and decontamination facilities were reported. Greene reported on a review of 34 trauma centers in the US, that indicated profound deficiencies in surge capacities.⁵

In the 2001 study in Canada, only 6% had decontamination equipment and 18% had a plan, whereas in 2007, 38% had decontamination equipment and 61% had a disaster response plan. With the exception of cyanide, there also was a change in the availability of chemical antidotes located on site or that were promptly available (13–34% in 2001 to 100% today). Only 82% of respondents had a cyanide antidote kit available, but this was increased from 56% in the prior study.

While there presently is no validated tool to assess overall hospital disaster preparedness,^{6–8} the questions posed in this study represent a comprehensive tool to measure emergency preparedness in Canadian emergency departments at an organizational level. This study should be repeated with the resources and authority of a federal agency such as the Public Health Agency of Canada or the Federal Ministry of Health. Additionally, tools should be developed to assess the level of knowledge and preparation of emergency department staff to cope with biological, chemical, and radiation events.

There is no standardized or formal Provincial, Territorial, or Federal assessment of institutional healthcare readiness. Nor has Accreditation Canada applied any rigid standards or assessment tools to review readiness. Periodic reviews of the disaster readiness of emergency departments should be performed, using a standardized tool, such as this survey. Recognizing that emergency-department readiness is meaningless in the context of a hospital that is not prepared, a formal hospital readiness assessment tool should be deployed. Similar to the US process, it should be a regulatory requirement of hospitals and emergency departments to submit their readiness data to a central, federal authority.

Limitations

A limitation of the present study is the low response rate, with only 34 emergency departments across Canada responding. There were 59 responses in the prior study, which was performed shortly after the 11 September terrorist attacks, and disaster preparedness was a topical issue.¹ The lower response

Question	Response			
	Yes	No	Don't Know	Null
Decontamination				
Does your facility have a permanent decontamination area or a plan to set up a temporary one in the case of a chemical event?	21	11	2	
Where is your decontamination area?				
Outside the hospital	11			
In the hospital but outside the ED	9			
Inside the ED	4			
Do you have a trained decontamination team?	15	7		12
If answered Yes, when did the decontamination team do their last exercise or activities?				
Less than 1 year ago	6			
1–3 years ago	7			
More than 3 years ago	1			
Don't know	1			19
In your decontamination plan, do you use a hot zone/cold zone system?				
Yes	12			
No	1			
Don't know	7			
Don't know what this system is	1			
Is part of your ED equipped for positive pressure ventilation to the outside?	14	5	3	12
Is there a system in place to retain contaminated runoff fluids?	8	7	7	12
If radiation is detected, does your organization have a formal response plan?	7	7	7	13

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Table 5—Decontamination preparedness (ED = emergency department)

rate in this study may reflect: (1) less immediacy to the problem as six years had passed since the 11 September attacks; (2) “survey fatigue” as the use of surveys for studies has grown considerably; or (3) the time constraints of emergency department chiefs, considering that participation in this study was voluntary without remuneration for the time spent in gathering the information. However, considering the importance of disaster readiness and that this is in the domain of expertise in emergency medicine, the low level of engagement, particularly in the larger urban centers, is troubling.

Another limitation is that it is not possible to provide a before and after comparison of specific centers that responded in the first study to those that responded in the second study, because the results in each study were pooled to maintain the confidentiality of data from individual institutions. The small sample size precludes a statistical analysis of before and after data, however, the data points enumerated in the questionnaire and the format of the questionnaire will provide a good basis for future research, and also will help Canadian emergency departments examine their current level of preparedness.

Question	Response			
	Yes	No	Don't Know	Null
Availability of Equipment				
Do you stock PPE suits or equivalent in the ED?	13	18	3	
If yes, was staff trained in the last year?	11	7		16
Are the PPE suits:				
Passive filter?	9			
Pressurized air?	5			
Don't know	6			14
Do you plan to supply N95 masks to your staff in the event of an influenza pandemic?	33			1
When were you fit-tested?				
Less than 1 year?	16			
1 year or more?	17			1
In the event of a pandemic, do you have a protocol in place to access appropriate supplies (i.e., gloves, masks, etc.)?	30	2	2	
How many HEPA filtered patient isolation rooms do you have in the ED?				
None	7			
Less than 5	25			
5 or more	2			
Does your facility have a cohort isolation protocol?	21	7	6	
Do you have the following equipment in your hospital for at least two of your staff?				
Gas masks with canisters?	33			1
Protective coveralls	33			1
Atropine	34			
Benzodiazepines	34			
Pralidoxine (Oxime; PAM)	19	8	7	
Neuraminidase inhibitors	17	6	10	1
Cyanide antidote kit	28	3	3	

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Table 6—Preparedness of equipment and supplies in case of disaster

Question	Response			
	Yes	No	Don't Know	Null
Availability of Equipment				
Do you have radiation detection equipment?	11	8	3	12
If answered Yes, is the equipment:				22
Permanently installed and monitored	0			
Handheld and stored in ED	1			
Handheld and stored elsewhere	9			
Don't know	2			

Table 6 (*continued*)—Preparedness of equipment and supplies in case of disaster

Conclusions

The HERO study demonstrates that, despite improvements, there remained gaps in Canadian healthcare facility readiness for disasters, specifically contamination events. It also highlights the

lack of any standardized assessment of healthcare facility CBRN readiness. Healthcare authorities should institute a formal readiness assessment tool incorporating the questions described in the present study that would allow them to identify deficiencies.

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