Canadian emergency department preparedness for a nuclear, biological or chemical event

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SEE ALSO PAGES 5 AND 12

ABSTRACT

Since the terror attacks of September 11th, emergency departments across North America have become more aware of the need to be prepared to deal with a mass casualty terror event, particularly one involving nuclear, biological or chemical contaminants. The effects of such an attack could also be mimicked by accidental release of toxic chemicals, radioactive substances or biological agents unrelated to terrorist activity.

The purpose of this study was to review the risks and characteristics of these events and to assess the preparedness of Canadian emergency departments to respond. This was done by means of a survey, which showed a significant risk of a mass casualty event (most likely chemical) coupled with a deficiency in preparedness — most notably in the availability of appropriate equipment, antidotal therapy and decontamination capability. There were also significant deficiencies in the ability to respond to a major biologic or nuclear event.

Key words: disaster, terrorism, emergency preparedness

RÉSUMÉ

Depuis les attaques terroristes du 11 septembre, les départements d'urgence à travers l'Amérique du Nord ont été sensibilisés davantage à l'importance de se préparer en prévision d'une catastrophe à victimes multiples, en particulier lorsque des polluants nucléaires, biologiques ou chimiques sont en cause. Les effets d'une telle attaque pourraient aussi se manifester dans le contexte d'une libération accidentelle de produits chimiques toxiques, de substances radioactives ou d'agents biologiques non reliés à des activités terroristes.

La présente étude avait comme objectif de passer en revue les risques et caractéristiques de ces événements et d'évaluer l'état de préparation des départements d'urgence canadiens en cas de désastre. L'étude prit la forme d'un sondage qui révéla un risque important de catastrophe à victimes multiples (très probablement d'origine chimique) associé à un état de préparation inadéquat, plus particulièrement au niveau de la disponibilité de l'équipement approprié, des antidotes et des capacités de décontamination. On notait également des lacunes importantes dans la capacité à répondre à une catastrophe majeure d'origine biologique ou nucléaire.

Introduction

Terrorism can be defined as an attack that targets non-combatants in a civilian location.[1] Since the terrorist attacks of September 11th there has been an increased awareness of the need to be able to respond to disasters and specifically the need to consider terrorist events in the possible disaster scenarios. In addition, the subsequent anthrax alert in the United States highlighted North America's vulnerability to non-conventional weapons of mass destruction. Tradition-

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Received: July 16, 2002; final submission: Oct. 10, 2002; accepted: Oct. 15, 2002

This article has been peer reviewed.

ally these have been categorized as Chemical, Biological, Radioactive and Nuclear (CBRN) weapons, with each category having its unique response requirements.

In addition to the threat of CBRN terrorism, there is a much greater risk of a CBRN accident, and Canada has experienced many such events, most often involving chemical agents. Reviews from the US, Australia and England have highlighted emergency department (ED) lack of preparedness for such situations.[2–7] Despite this, there has been no formal review of Canadian ED preparedness for CBRN events. The objective of this paper was to review Canadian ED disaster readiness, specifically for events involving biological, chemical or radioactive materials.

Methods

This was a cross-sectional online survey of Canadian EDs. The survey was addressed to the chief of each ED.

Survey development

Survey questions were developed based on a search of relevant literature. The survey (see Appendix 1, p. 26) included 24 questions divided into 4 categories: risk assessment, general disaster preparedness, preparedness for a biological event, and preparedness for a chemical or nuclear event. Prior to distribution, the draft questionnaire was reviewed for face validity and comprehensibility.

Survey method

When the survey was finalized, a Web-based form was designed and, on Nov. 2, 2001, it was posted on a dedicated Web page located on the Hamilton Health Sciences Corporation, Hamilton, Ont., server. The system allowed responders to click only 1 response for each of the survey questions, and automatically collated the responses into a spreadsheet. The system was tested with dummy data to ensure that it functioned accurately. After pilot testing, all dummy data was erased.

Population surveyed

The Canadian Association of Emergency Physicians provided a list of ED chiefs and their email addresses. All department chiefs were contacted by email, invited to fill in the questionnaire, and given the appropriate URL (Web address). Chiefs responsible for multiple sites were asked to submit a separate questionnaire for each site. A total of 3 emailings were made, to maximize response rate. To avoid the possibility of duplicate responses (a potential hazard of online questionnaires) the questionnaire included a postal code identifier. To avoid unwanted responders, there were no links to this page from any other locations.

Data analysis

The last response was received on Dec. 3, 2001, one month after the questionnaire was posted. Questionnaires with inappropriate responses were flagged for manual review. In cases where there were conflicting entries from a single postal code and it was unclear which response was correct, a "null" value was input. If it was clear that the newer entry corrected a previous internal data conflict and the newer data set was internally consistent, the newer data was used. This only applied to the same 1 question in 2 separate submissions. The "null" field was also used in cases where a question was left unanswered. The data set was locked on Mar. 7, 2002.

Results

Of 206 emails sent to ED chiefs, 26 email addresses were determined to be incorrect. Of the remaining 180 eligible respondents, 59 (30%) completed the survey. Based on postal code identifiers, there were 5 duplicate and 1 triplicate entries.

Most respondents indicated that their ED is at risk of a CBRN event, with 47 (80%) EDs being close to a hazardous material transport route, 25 (42%) close to a chemical factory or manufacturing site, and 7 (12%) close to nuclear facilities (Table 1). Only 1 ED was defined as definitely not at risk. Table 1 also shows that general disaster preparedness was inadequate. Although 56 (95%) EDs had a disaster plan, only 28 (47%) had reviewed it, only 22 (37%) had run a paper trial and only 11 (18%) had run a disaster exercise during the 12 months prior to Nov. 2, 2001, the date the questionnaire was first posted.

Despite respondents categorizing their ED as being "at risk," most of these EDs were ill prepared for a CBRN event. Only 37 (63%) had a protocol to report sentinel bioevents, 24 (41%) respondents were aware of their local pandemic plan, and 22 (37%) reported being able to obtain the necessary supplies in a biological crisis. The highest CBRN risk was chemical, yet only 18 (30%) respondents stated that their ED had a decontamination area and only 3 EDs (5%) had respiratory equipment for their staff. There were 8 EDs (14%) with respiratory equipment and no plan.

Table 1 shows that 23 EDs (39%) had sufficient benzodiazepines to deal with more than 10 patients and that 8 EDs (14%) had enough atropine to treat 5 patients. Only 20 EDs (33%) had pralidoxime, and 17 more (29%) could obtain pralidoxime if necessary. Slightly more than half of

https://doi.org/10.1017/S148180350000806X Published online by Cambridge University Press

Table 1. Results of cross-sectional online survey of Canadian emergency departments

Question*	Response: Yes	No	Don't know	Null†
Risk assessment				
Proximity of ED (within 30 km) to:				
Chemical transport line	47	3	5	4
Chemical factory	25	11	18	5
Nuclear power plant	7	50	0	2
General disaster preparedness				
Does your ED have a disaster plan?	56	1	??	2
If disaster plan has been reviewed, was the ED involved in the revision?	51	4		4
	<1yr	1–3 yr	>3yr	Null
Time since last review?	28	20	6	5
Time since last paper trial?	22	18	13	6
Time since last full exercise?	11	14	30	4
	Yes	No	Don't know	Null
Bio-preparedness				
Do you have a protocol to report index cases?	37	15	2	5
Do you have a protocol to access supplies?	22	26	6	5
Is there a regional pandemic plan?	24	20	10	5
Decontamination capability				
Do you have a permanent decontamination area or a plan to set one up?	18	34	3	4
Do you use a hot zone / cold zone system?	5	8	10	36
Is part of your ED equipped for PPV to the outside?	8	15	1	35
Is there a system in place to retain contaminated runoff fluids?	8	11	5	35
	Outside	Inside		Null
Where is your decontamination area?	11	9		39
	Yes	No	Don't know	Null
Availability of equipment				
Does your ED have these items for at least 2 staff members?				
PPV masks	6	38	10	5
Passive gas masks	6	39	10	4
Protective coveralls	24	26	5	4
Availability of antidotes				
Are these antidotes stocked in your ED or easily accessible to the ED?				
	<30	30–100	>100	Null
Atropine, ampules	34	13	8	4
	<300	300–1000	>1000	Null
Benzodiazepines, mg (total diazepam or equivalent)	31	16	7	5
	Yes	No	Don't know	Null
Pralidoxine (Oxime; PAM)	20	18	15	6
If No, do you know where to get it?	19	14		26
Cyanide antidote kit	33	14	7	5
If No, do you know where to get it?	13	10		36
	<10	10–30	>30	Null
If Yes, how many kits?	36	3	0	20

* See Appendix 1 for expanded versions of queries. † Null = an unclear response or unanswered question. See Methods section, "Data analysis," for an expanded definition of this category. PPV = positive-pressure ventilation

https://doi.org/10.1017/S148180350000806X Published online by Cambridge University Press

the EDs (55%) stocked cyanide kits, with another 22% able to obtain them if required.

Discussion

The key finding of this study is that Canadian EDs — and by inference Canadian hospitals — are unprepared for a CBRN event, this despite their chiefs identifying the ED as being at risk. Many lack an updated plan, and those that have one have rarely tested it. Most respondents reported their ED as having inadequate equipment and medications. While this study focused on CBRN readiness, it would appear from the data that general disaster readiness is also inadequate. Most respondents to this survey were aware of significant hazards in their region and needed to achieve a higher level of preparedness at their ED for a CBRN event — particularly a chemical event.

CBRN events are unavoidable because systems cannot be made foolproof. In fact, during the past 10 years, the most common cause of biologic, chemical and nuclear contamination has been human error or mechanical failure of a containment system.[8] North America produces 60 000 different chemicals (of which 57 500 are in the workplace), and 53 000 are potentially hazardous. Every year 4 billion tons of these are transported between 100 000 North American locations. In 1994 CHEMTREC (Chemical Transportation Emergency Center, a public phone service of the Chemical Manufacturers' Association) logged over 200 000 calls,[8] 4% of which were directly related to Hazmat (hazardous materials) (www.hazmat.dot.gov/) emergencies. In 1993 there were 3945 Hazmat releases in the US, with 1.6 events every day that caused death, injury or evacuation.[9]

Major chemical incidents involved cyclohexane (Flixborough**,** UK, 1974), chlorine (Missisauga, Canada, 1976), dioxins (Seveso, Italy, 1976), PCBs (polychlorinated biphenyl waste) (Saint-Basile-le-Grand, Canada, 1988), benzene, toluene and xylene (Hagersville, Canada, 1990) and, most tragically, methyl isocyanate gas (Bhopal, India, 1984). Biological incidents range from the accidental release of anthrax from a Soviet facility in 1979 (causing 79 cases and 68 deaths)[10] to the recent *E. coli* (*Escherichia coli*) incident in Walkerton, Canada. Radiation events range from the occasional steam releases from reactors to full-fledged disasters like the one in Tokaimura, Japan in 1999. Of concern, since 1958 more than 1.8 million radioactive consumer devices have been distributed in the US, with minimal regulatory oversight.[11] Given the penetration of these agents in society and the scope of their use, it is clear that accidental CBRN events are both likely and potentially far-reaching. Nuclear, biological and chemical events differ in the emergent and ongoing response they require (Table 2),[10–12] but this does not rule out the possibility of a combined event.

Terror events

The September 11th attacks sensitized North Americans to the devastating impact terrorism can have. It is clear now that when developing disaster response plans we must consider the possibility of terror events. Recognizing this, the US Center for Disease Control and Prevention (CDC) has prepared lists of major biologic and chemical terror agents (Table 3) and categorized them by lethality, transmissibility and resource requirements. To date, most terror events have been characterized by large numbers of patients with blunt and penetrating trauma.[13] As such, these events did not differ much from other mass casualty events. Updated risk analysis suggests a worrisome change in this pattern. In addition to the capability of inducing trauma there is evidence that terror organizations and nations who support them are developing nuclear, biologic and chemical capability.[10,14–16] Documents seized from the al-Qaeda network in Afghanistan reveal their attempts to obtain CBRN weapons. Recently, Hamas, the Islamic Resistance Movement, has selectively used hepatitis B carriers as suicide bombers (Dr. Nathan Gottehrer, Director, Emergency Department, Shaare Zedek Hospital, Jerusalem: personal communication, 2002). The anthrax mailings through the

Table 2. Characteristics of nuclear, biological or chemical events

Characteristics	Nuclear	Biological	Chemical
Event onset	Rapid	Slow	Rapid
Speed of transmission	Rapid	Slow	Rapid
Transmissibility	For particulate only	Agent dependent	Agent dependent
Detection	Easier	Difficult	Easier
Resource consumption	Rapid, short- and long-term	Gradual, long-term	Rapid, short-term
Bed use	Hospital	Mixed hospital / community	Hospital
Decontamination needs	Critical for particulate	Agent dependent	Critical for all
Antidote / Therapy	? Potassium iodide ? Marrow transplant	Agent dependent	Class dependent

https://doi.org/10.1017/S148180350000806X Published online by Cambridge University Press

US postal service are another example of operational deployment of bioterrorist methodology.

The US is the most powerful nation on earth and the prime target of terror movements dedicated to destabilizing global power structures. Because of our proximity and our large shared border, terrorists may use Canada as a staging ground for attacks on the US, and this raises the possibility of an accidental CBRN event on Canadian soil. In addition, our role as a US ally could provoke terror attacks directed at Canadian citizens.

Not all terror events are carried out by foreign nationals. In 1984 a religious commune in The Dalles, Oregon, used a biological agent (salmonella) to contaminate restaurant salad bars, demonstrating ease of access and use.[17] In 1995, a fanatic religious group, Aum Shinrikyo, carried out a sarin nerve gas attack on the Tokyo subway. As the information on how to prepare and deliver weapons of mass destruction, particularly biological[10,17–19] and chemical agents,[16] becomes more widely available, and as the ideology of terror movements disseminates, it becomes only a matter of time before internal extremist groups combine the two.

Radiological events

Radiological events may be nuclear or radioactive. A nuclear event is the detonation of a nuclear device with the subsequent explosive and radioactive effects. A radioactive event is the dissemination of radioactive materials by conventional means, either accidental (e.g., a leak of radioactive steam from a reactor) or malicious. One disturbing but possible scenario is a "dirty bomb,"[12] which is an explosive device that spreads radioactive waste over a large area.

Victims of radiological events can be divided into 2 categories: irradiated and contaminated. Patients who have been irradiated are not a risk to others, while those who have been contaminated, by virtue of ingesting or being covered by radioactive substances, can irradiate others nearby. Contaminated patients must be decontaminated as soon as possible to minimize the injury they sustain and the risk they pose to others. Ideally, decontamination

Table 3. Biologic and chemical terror agents*

Bioterror agents

CDC Category A:
Easily disseminated, high mortality rates and require special action

Variola major (smallpox)	*Bacillus anthracis* (anthrax)
Yersinia pestis (plague)	*Clostridium botulinum* toxin (botulism)
Francisella tularensis (tularemia)	Filoviruses (e.g., Ebola and Marburg hemorrhagic fevers)
Arenaviruses (e.g., Lassa)	Junin (Argentine hemorrhagic fever) and related viruses

CDC Category B:
Moderately easy to disseminate, moderate morbidity and low mortality; require diagnostic and surveillance capacity

Coxiella burnetti (Q fever)	*Brucella* sp. (brucellosis)
Burkholderia mallei (glanders)	Alphaviruses (e.g., Venezuelan, eastern and western equine encephalitis)
Epsilon toxin of *Clostridium perfringens*	
Ricin toxin from *Ricinus communis* (castor beans)	*Salmonella* sp.
Staphylococcal enterotoxin B	*Escherichia coli* O157:H7
Cryptosporidium parvum	*Shigella dysenteriae*
Vibrio cholerae	

CDC Category C:
Emerging pathogens that could be engineered for mass dissemination in the future; potential for high morbidity and mortality

Infectious disease threats such as Nipah virus and hantavirus

Chemoterror agents

Blister agents (topical vesicants) (e.g., mustard gas [bis- (2-chloroethyl) sulfide])	Blood agents (e.g., hydrogen chloride, hydrogen cyanide [AC])
Choking / lung agents (block oxygen metabolism) (e.g., phosgene or cyanide)	Nerve agents (block acetyl choline metabolism) (e.g., Sarin [isopropyl methylphosphonofluoridate], VX [*O*-ethyl *S*-(2-diisopropylaminoethyl) methylphosphonothioate], Soman [pinacolyl methyl phosphonofluoridate] and Tabun [dimethylphosphoramido-cyanidate])
Riot control agents (local, milder, irritants) (e.g., Mace CS or Mace CN)	

CDC = US Center for Disease Control and Prevention
*Adapted and abridged from the CDC Public Health Emergency Preparedness & Response Web page (www.bt.cdc.gov/agent/agentlist.asp).

https://doi.org/10.1017/S148180350000806X Published online by Cambridge University Press

should take place before entry to a treatment facility, unless the facility and staff are equipped to function in a radioactive environment. Protection and monitoring of the decontamination crew or the hospital staff will depend on the type of radiation because different forms of particulate radiation have different penetration.[12] Those who have ingested radioactive material rarely put caregivers at risk by virtue of proximity and do not need external decontamination, but their body waste does pose a radiation hazard. The treatment of radiation-induced illness is beyond the scope of this paper.

Chemical events

Chemical agents are like radioactive particles in that they may adhere to skin and clothing and mandate decontamination. Table 2 shows that they have significant variability in terms of onset, volatility, vapour density, lethality and method of action. ED caregivers cannot wait to identify the specific agent and must instead focus on self-protection, identifying the class of agent and toxidrome management. The characteristics of the agents, particularly the volatility and vapour density,[15,16] will determine the degree of risk to caregivers from their patients "off-gassing."

The argument that the patients can be decontaminated on site prior to transport, making decontamination in the ED redundant, is a common fallacy.[2,8] The Tokyo experience shows that, regardless of existing disaster plans, patients will make their way independently to the nearest ED prior to decontamination.

Biological events

Biological events differ from chemical and nuclear events in speed of onset and resources required.[10] Biological agents are characterized by high potency, easy delivery, substantial accessibility, low visibility, and latency of onset. The latency of biological agents makes them hard to detect, and epidemiologic data verifying the nature of an outbreak are typically slow in coming. As a result, biological events may be ongoing for significant periods of time before they are recognized by health authorities. Rapid identification of index cases to regional health authorities allows for pattern recognition and is critical to an organized early response.

General disaster preparedness in Canada

The disaster plans of most institutions are designed for the intake of multiple patients with conventional problems over a short time span. Thus, they should be able to deal with a mass casualty event, be it accidental or a "conventional" terror attack. This assumes that the disaster plan of the institution is functional, has been updated and has been practised. Unfortunately, in this survey at least half of the respondents had not reviewed their plan within the past year, and 10% had not reviewed it for over 3 years. Less than half the EDs had run any kind of exercise within the past year, increasing to two-thirds within the last 3 years. The vast majority of EDs ran only paper exercises, not requiring the actual moving of patients and resources. These exercises are of questionable value. Only 4 EDs (6.7%) had run any live exercise within the past year, 30% within the past 3 years.

In view of the significant recent administrative and manpower changes within the health care system, it is possible that at many EDs the disaster plan may no longer be applicable and that the ED staff may not be adequately trained. Thus, we cannot assume that our hospital disaster plans are functional. Computer simulation and planning tools may be useful to help bridge this preparation and training gap.[20,21]

Chemical and radiological preparedness in Canada

Decontamination

Decontamination of chemically or radiologically contaminated patients, ideally prior to entering the health care facility, is a critical step in the delivery of care.[8,12,15,16] In the review of decontamination capability, only 18 of 59 respondents (30%) stated that their ED had a decontamination area or a plan to establish one. Of these, there was an almost even split between those EDs with an internal or external decontamination site.

In order to assess the functionality of the decontamination plan, we asked respondents whether their ED had a hot/cold zone system in place. The system defines 2 areas: one where contaminated patients arrive for decontamination (the "hot" zone) and one where decontaminated patients receive definitive care (the "cold" zone). Decontamination occurs at the border between the zones.[22] The hot zone should include an intubation station for the resuscitation of critically ill patients, and the resuscitation team must be able to perform techniques such as intubation while wearing protective equipment (see Fig. 1).[16,22] Absence of this kind of system indicates a potentially ineffective plan.[16,23]

In our survey only 5 EDs (8% of respondents) with a decontamination plan had a hot/cold system in place. This raises the concern that, even among hospitals with decontamination plans, the systems may not be sufficient to

https://doi.org/10.1017/S148180350000806X Published online by Cambridge University Press

manage large events involving contaminated patients. Similar US surveys done prior to September 11th reported that only 44% to 63% of facilities could receive chemically-exposed patient and 41% to 47% did not have decontamination facilities.[2,8,24]

In the absence of an external decontamination protocol, there should be a contingency plan in the event that incoming patients contaminate the ED.[8,25] In an ideal situation, particularly if the ED is near the site of the event, there would be the option of shutting down the department partially or completely to isolate it from the contaminated area. Positive pressure ventilation (PPV) and an airlock system would provide safe access. This usually requires a purpose-built department because it is costly to retrofit an existing structure. Only 13% of EDs covered by this survey have PPV capability, and the same number of respondents stated that their ED could manage contaminated run-off fluids.

Equipment availability

EDs that have no decontamination plan, and that cannot keep contaminated patients and equipment outside the ED, must provide protective equipment so staff can function at relatively low risk. This may involve having staff and patients wear gas masks and protective gear while in the hospital.[8,9,22] But in this survey, only 41% of the EDs were stocked with protective coveralls (list price, $5.18; Lawlor Safety) and only 19% had either gas masks or positive pressure ventilation masks. This is inadequate, given the fact that 85% of EDs could not decontaminate patients without bringing them in to the building. A recent US survey reported that 63% of EDs had access to protective equipment (i.e., gowns, masks and gloves) but only 30% had any respiratory equipment whatsoever.[2,24]

Israeli physician in full NBC protective gear intubating a patient. Vest is labelled "Intubator" because it is impossible to identify individuals once gear has been put on.

Antidote availability

Preparedness for chemical agents requires a readily available stock of antidotes. In this survey, we asked specifically about atropine, cyanide kits, and benzodiazepines and pralidoxime (for nerve agents). Assuming that patients requiring maximal support would consume 20 mg of atropine and 30 mg of diazepam or equivalent,[16,25,26] most sites surveyed had inadequate supplies on hand. This data is worrisome because, terrorism aside, these antidotes are useful for managing patients with a variety of with toxic ingestions (e.g., insecticides and industrial agents). While atropine and benzodiazepines are routine ED items, the amount available in most surveyed EDs was insufficient to deal with a mass casualty chemical disaster. Health regions often plan to store drugs in a central repository and deliver them rapidly to EDs when requested. This process may not work in a true event, where transport and delivery systems are slow or disrupted (as has occurred in past Canadian disasters).

Biological preparedness in Canada

In this survey, only 63% of sites had a protocol for reporting suspected index cases — an extremely worrisome finding in view of the key role reporting plays in the early response to a bio-event. This is also surprising in view of the fact that having a reporting protocol costs the hospital nothing and can save the health care system significant cost by minimizing the spread of disease. To address this concern, Edmonton has developed the innovative concept of using Telehealth and other telephone triage lines for syndromic surveillance. The information systems supporting these triage and advice services can be used to detect and flag clusters of disease in a given area or presumptive index cases.

Readiness for an influenza pandemic can be considered a surrogate marker of preparedness for bio-terror. Unfortunately, in this survey only 41% of EDs were aware of a regional pandemic plan and only 37% had a protocol to access supplies if required.

https://doi.org/10.1017/S148180350000806X Published online by Cambridge University Press

Limitations

This study enrolled a convenience sample of respondents and had a small sample size. In addition, although it assessed the presence of disaster response components, it did not address the quality of the disaster plans described. Nevertheless, the data suggest a worrisome lack of preparedness, particularly a lack of tested disaster plans and decontamination facilities that could handle large numbers of patients without putting EDs at risk.

Conclusion

Hospitals across Canada need to revise their disaster readiness plans, with CBRN events in mind. Canadian hospitals need realistic and verifiable standards for CBRN and general disaster readiness that can be applied and tested regularly as part of the accreditation process.

Competing interests: None declared.

Acknowledgments: Thanks are due to Mark Nahirny, Barb Brandt, Jeff Vallentin, Andy McCallum, Colin Webber (all of Hamilton Health Sciences), Dan Cass (of St. Michaels Hospital, Toronto) and Julia Kollek for their help in preparing this paper.

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See page 26 for Appendix 1.

Appendix 1. Study Questionnaire				
RISK ASSESSMENT				
Is your facility within 30 km of a rail or road line used to transport industrial chemicals?[6]		Yes	No	Don't know
Is your facility within 30 km of a factory that uses or manufactures ammonia, chlorine, bromine, hydrogen chloride, hydrogen fluoride, formaldehyde hydrogen cyanide, benzene, or pesticides?		Yes	No	Don't know
Is your facility within 30 km of a nuclear power plant?		Yes	No	Don't know
GENERAL DISASTER PREPAREDNESS				
Does your facility have a disaster plan?		Yes	No	
If No: Please stop here and submit the questionnaire. Thank you for your time. If Yes: Continue questionnaire				
When was the last time your plan was reviewed?	Within a year	1–3 years ago	Over 3 years ago	
Was the ED involved in the review process?		Yes	No	
When was the last time your plan was trialed on paper?	Within a year	1–3 years ago	Over 3 years ago	
When was the last time your plan was trialed in a full exercise?	Within a year	1–3 years ago	Over 3 years ago	
PREPAREDNESS FOR A BIO EVENT				
In the event that you suspect a patient has been deliberately contaminated with a bio-terror agent do you have a protocol in place to report this?		Yes	No	Don't know
In the event that you suspect a patient has been deliberately contaminated with a bio-terror agent do you have a protocol in place to access appropriate supplies?		Yes	No	Don't know
Are you aware of a local pandemic plan in the event of a significant bio event (e.g., flu pandemic)?		Yes	No	
PREPAREDNESS FOR A CHEMO/NUCLEAR EVENT				
1) Decontamination area				
Does your facility have a permanent decontamination area or a plan to set one up in the case of a chemical event?		Yes	No	Don't know
If No or Don't know: Please go to question 2. If Yes: Continue questionnaire				
Where is your decontamination area?	Outside the ED		Inside the ED	
Do you use a hot zone/cold zone system?	Yes	No	Don't know	Don't know what this system is
Is part of your ED equipped for positive pressure ventilation to the outside?	Yes	No	Don't know	
Is there a system in place to retain contaminated runoff fluids?	Yes	No	Don't know	
2) Equipment				
Do you have the following equipment for at least two of your staff?				
Positive pressure ventilation masks		Yes	No	Don't know
Passive gas masks		Yes	No	Don't know
Protective coveralls		Yes	No	Don't know
3) Antidotes				
Do you stock the following antidotes in the ED or are they easily accessible to the ED around the clock? (For common drugs, estimate how much you stock.)				
Atropine	Less than 30 amps	From 30 to 100	> 100 amps	
Benzodiazepines	< 300 mg (30 amps) total Diazepam or equivalent	From 300 to 1000	> 1000 mg	
Pralidoxine (Oxime; PAM)	Yes	No	Don't know	
If No, do you know where to get it?		Yes	No	
Cyanide antidote kit		Yes	No	Don't know
If No, do you know where to get it?		Yes	No	
If Yes, how many?	Less than 10 kits	From 10 to 30	> 30 kits	

https://doi.org/10.1017/S148180350000806X Published online by Cambridge University Press