

RESEARCH

Improving Hospital Preparedness for Radiological Terrorism: Perspectives From Emergency Department Physicians and Nurses

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ABSTRACT

Background: Hospital emergency department (ED) clinicians will play a crucial role in responding to any terrorist incident involving radioactive materials. To date, however, there has been a paucity of research focusing specifically on ED clinicians' perspectives regarding this threat.

Methods: At the request of the Centers for Disease Control and Prevention, researchers at the University of Alabama at Birmingham conducted a series of 10 focus groups (total participants, 77) with ED physicians and nurses at hospitals in 3 US regions. Participants considered a hypothetical "dirty bomb" scenario and discussed their perceptions, concerns, information needs, preferred information sources, and views of current guidance and informational materials.

Results: Study participants consistently expressed the view that neither EDs nor hospital facilities are sufficiently prepared for a terrorist event involving radioactive materials. Key clinician concerns included the possibility of the hospital being overwhelmed, safety of loved ones, potential staffing problems, readiness problems, and contamination and self-protection. Participants also expressed a need for additional information, strongly disagreed with aspects of current response guidance, and in some cases indicated they would not carry out current protocols.

Conclusions: This study is the first to examine the views, perceptions, and information needs of hospital ED clinicians regarding radiological terrorism. As such, the findings may be useful in informing current and future efforts to improve hospital preparedness. (*Disaster Med Public Health Preparedness*. 2008;2:174-184)

Key Words: radiological terrorism, hospital preparedness, disaster management

Along with first responders, hospitals play a central role in addressing the health impacts of terrorism events.¹⁻³ "Hospitals bear the brunt of accepting and treating" affected individuals, making them "the epicenter of medical care delivered to those who are injured."^{2,3} Furthermore, when a disaster or emergency strikes a community, many people go to a hospital because it offers them a feeling of safety or because they assume hospitals have needed antidotes, medications, or treatments.¹

Since the September 11, 2001 terrorist attacks, government agencies and professional societies have focused greater attention on the importance of hospitals, particularly emergency departments, for terrorism preparedness and response. Although significant progress has been made, major hurdles and challenges remain.³ As a recent Institute of Medicine report concluded, emergency departments (EDs) "are better prepared than they used to be, but still fall short of where they should be."^{3,4}

TERRORISM INVOLVING RADIOACTIVE MATERIALS

One emerging area of attention relates to "dirty bombs" and other forms of terrorism involving radio-

active materials.⁵ A 2006 survey of 117 foreign policy experts ranked terrorism involving radioactive materials as the second most likely threat facing the United States in the coming years, with only suicide bombings perceived as more likely.⁶ Similarly, a 2005 survey of 85 experts in the field put radioactive dirty bombs at the top of the list of potential chemical, biological, or radiological threats.⁷ This growing concern is reflected in national planning and training. Two of the 15 national planning scenarios developed by the US Department of Homeland Security to guide preparedness efforts involve radioactive materials, and the "Topoff 4" national preparedness exercise held in October 2007 focused specifically on radiological terrorism.⁸

ROLE OF EMERGENCY DEPARTMENT CLINICIANS

ED clinicians have a crucial role to play in the management of any terrorist incident involving radioactive materials. Whether patients arrive by ambulance or by self-transport, the hospital ED functions as "the primary portal of entry" for people needing care.³ The actions of ED clinicians—from identifying and treat-

ing health effects to addressing patient concerns—will be central to the success or failure of efforts to manage the event and its health consequences.

As new initiatives are undertaken to improve hospital readiness for radiological terrorism, it will be crucial for these efforts to be informed by an understanding of the views of frontline clinicians. Even though there are many valuable articles in the literature on hospital and medical management issues,^{9–14} and even though the training experiences and views of first responders, physician assistants, office-based physicians, and other key professional groups have been examined,^{15–21} there has been a dearth of research focused specifically on the perspectives of hospital ED clinicians regarding radiological terrorism.

To fill this important void, and to help guide the development of new training and information tools and strategies aimed at enhancing hospital preparedness, the Centers for Disease Control and Prevention (CDC) commissioned a study of ED physician and nurse perspectives on radiological terrorism. Researchers from the University of Alabama at Birmingham, working in coordination with the CDC, conducted a series of focus groups at hospitals across several geographic regions of the United States. The aim was to gain a better understanding of the perceptions, reactions, concerns, information needs, preferred information sources, and views of existing guidance and informational materials related to radiological terrorism. This article reports findings from the study and examines their implications for preparedness and response.

METHODS

Study Design

A total of 10 ED physician and nurse focus groups (total participants, 77) were conducted in 3 US regions between April 2005 and June 2006. Based on previous contacts with health care facilities and the medical community, the 3 regions chosen for this exploratory study were the southeast, the northeast, and the west. To ensure consistency and enhance reliability, all 10 focus groups were led by the same experienced focus group facilitator. In keeping with established focus group practice, the groups ranged in size from 5 to 13 participants, with the average being 8 participants.

Discussion was structured using a focus group guide involving a hypothetical terrorism scenario. The guide included a series of broad topics and questions intended to elicit comment in the following areas: responses to the scenario, challenges associated with the scenario, professional concerns, personal concerns, information needed/desired during the event, preferred informational tools, sources of information, trusted/credible sources, current training and resources, strengths and weaknesses of current training and resources, and views of current response guidelines and protocols.

To avoid any potential hierarchy-related inhibiting effects on discussion, the focus groups for physicians and nurses were

held separately. Standard focus group facilitation techniques were used to ensure full involvement of all of the participants and to avoid any potential overdominance situations. The focus groups typically lasted 60 to 90 minutes; however, in a few cases, participants opted to extend the discussion to as much as 2 hours.

The groups were conducted at 5 different hospitals, with 1 physician group and 1 nurse group held at each location. Hospitals were chosen to ensure inclusion of a range of hospital types (urban, suburban, and rural).

Participants in all of the focus groups either had a primary assignment in the hospital ED or, in the case of smaller hospitals or hospitals in rural areas, were designated to work in the ED in the event of a mass casualty incident.

Participant Recruitment

Recruiting health care professionals for focus groups can be challenging. The problem is to find a way to bring 6 or 8 busy and sometimes hard-to-reach individuals together “at the same place and at the same point in time.”²² In the case of ED clinicians, the challenges can be even greater. For example, unanticipated emergencies can result in the cancellation of an already-arranged focus group. To facilitate the recruitment process, contacts were made with hospital associations, state chapters of physician and nurse professional societies, hospital systems, and similar health-related organizations. Recruitment efforts were designed to ensure inclusion of individuals with widely varying levels of ED experience.

All aspects of the study were conducted in accordance with institutional review board guidelines. To ensure confidentiality, names were not used in focus group discussions, recordings, or transcripts. Instead, individuals used numbers (eg, #1, #2) to identify themselves. Likewise, names were not included on demographics forms. Food was provided and participants were given \$50 gift cards to cover any costs associated with participation.

Hypothetical Terrorism Scenario

The focus group guide used a progressively unfolding, hypothetical terrorism scenario involving a radiological dispersal device, or dirty bomb (Table 1). In the first segment, participants were told that there was an alert indicating that a terror attack, possibly involving radioactive materials, could occur somewhere in the state. In the second segment, participants were informed that an attack had occurred in the city served by their hospital, and that radiation had been detected at the incident scene. In the final segment, it was confirmed that a radiological dirty bomb was involved. In addition, once all of the scenario components had been completed, participants were provided with a copy of a new radiological terrorism emergency management pocket guide for clinicians. The guide, which had been developed and

TABLE 1

Hypothetical Radiological Terrorism Scenario	
Scenario Sequence	Discussion Guide Verbatim Language
Part I: Alert	You wake up early on a Friday morning and turn on the news to hear that federal authorities have issued a terrorism alert based on knowledge of a credible threat that a terrorist group may be planning an attack in (state). Although the threat is not specific regarding the type of attack, officials indicate there is a possibility it may involve radioactive materials.
Part II: Notification	During lunchtime, your hospital receives emergency notification that there has been an explosion in (city served by hospital) and that radiation has been detected by first responders at the scene. Initial reports from the site indicate that some people have been killed and hundreds of people have been hurt, many suffering injuries and burns from the blast. Members of the public in the area of the incident are being advised to shelter in place until the extent of radiation from the attack is known.
Part III: Further Information	Incident Command confirms that a radiological dispersal device, or dirty bomb, was detonated and that people in the area may have been exposed to radioactive contamination. Seriously injured people are being transported by ambulance to area hospitals, including yours. In addition, significant numbers of people are beginning to self-report to the ED.
Part IV: Pocket Guide	A new radiological terrorism emergency management pocket guide for clinicians was prepared recently, and there is a great deal of interest in getting feedback on it from professionals in your field. The target audience is hospital ED clinicians and the guide is designed to be pulled out during the crisis phase of a radiological terrorism incident and serve as a rapid reference. If you could take a few minutes to look over the guide, we would appreciate it. Please feel free to write on it or make comments on the copy you have.

reviewed by a range of specialists inside and outside the CDC, included a brief summary of key protocols for hospital management of radiological terrorism events.²³ Participants were asked to review the guide and provide feedback.

Analysis

Digital audio recordings of the focus group discussions were transcribed by the researchers, and the draft transcripts were compared against the original recordings and corrected as needed. Transcripts were then analyzed using computer-based thematic analysis. This well-established qualitative analysis strategy involves making repeated passes through the transcripts, coding or tagging pieces of text, clustering coded text into broad themes or general categories, and progressively identifying patterns and regularities. As the analysis proceeds, a “funneling” of the data within the broad categories takes place, and smaller subcategories and subthemes are identified and refined.²⁴

Once the thematic analysis had been conducted and the patterns and regularities were identified, the researchers sought to quantitatively assess the relative strength of the various themes and subthemes. To do so, a count was made of the total number of separate statements related to each theme or subtheme. Because it was theoretically possible for this ranking method to be thrown off if a single participant made a disproportionately large number of statements, it was decided to also use a second ranking method. This time, a count was made of the total number of separate individuals making statements related to each theme or subtheme. Whereas the first method counted the total number of separate statements in a category, the second method counted the total number of separate individuals speaking on that subject, regardless of how many statements each one made. In

this manner, it was possible not only to identify the various participant views, issues, and concerns but also to rank their strength in terms of how often they occurred or how many people raised them in the focus group discussions.

RESULTS

Demographics

Analysis of demographic data indicated that overall, 38% of participants were men and 62% were women (Table 2). However, this balance was not observed when considering the 2 professional groups separately: 93% of the nurses were women and 74% of the physicians were men. The average age among nurses and physicians was similar: 43 and 41 years, respectively. About half (52%) of the study participants resided in the south-east, whereas 27% lived in the west and 21% lived in the northeast. All of the focus group participants indicated that English was the language spoken most at home. Almost all of the nurses, 98%, reported that they were white; 1 nurse declined to answer. The physician groups were more ethnically diverse: 79% identified themselves as white, 6% Hispanic/Latino, 6% Asian, 6% African American, and another 3% declined to answer. Most participants were married or living with a partner: 79% of nurses and 71% of physicians. Also, a majority (79% of nurses and 54% of physicians) had children. All of the nurses indicated that they were registered nurses. A few had more advanced degrees or certifications.

Emergency Department Experience

By design, the focus groups were conducted in hospitals serving different types of communities: 21% of participants reported that their facility serves rural communities, 33% reported that their facility serves urban communities, and 29% reported that their facility serves suburban communities. The remaining 17% did not answer this question.

TABLE 2

Demographic Characteristics of Study Participants			
Characteristic/Category	Nurses (n = 42)	Physicians (n = 35)	Totals (n = 77)
Age, mean	43.3	40.6	42.1
Sex			
Male, %	7	74	38
Female, %	93	26	62
Ethnicity/race			
African American/black, %	—	6	2.5
Asian/Pacific Islander, %	—	6	2.5
White, %	98	79	90
Latino/Hispanic, %	—	6	2.5
Missing, %	2	3	2.5
Marital status			
Single, %	14	29	21
Married/living with partner, %	79	71	74
Divorced or separated, %	7	—	5
Children			
Yes, %	79	54	68
No, %	21	46	32
Education			
Some college, %	4	—	3
College degree, %	79	—	43
Graduate degree, %	17	100	54
ED experience, y			
Average	10.6	8.5	9.7
>30, %	—	3	1
26–30, %	5	3	4
21–25, %	5	3	4
16–20, %	14	6	11
11–15, %	26	17	22
6–10, %	24	23	23
1–5, %	21	25	23
<1, %	5	20	12
ED role			
Primary assignment, %	90	69	80
Assigned to ED in emergency, %	10	29	18
Missing, %	—	2	2
Area served by hospital			
Urban, %	29	40	33
Suburban, %	31	26	29
Rural, %	29	11	21
Missing, %	11	23	17
Where participant resides			
Southeast, %	43	63	52
Northeast, %	26	14	21
West, %	31	23	27

The vast majority (90%) of the nurses had a primary assignment in the hospital ED, and 69% of the physicians had an assignment there. The remaining participants were assigned to the ED during mass casualty events. This was often the case in smaller or more rural hospitals, where the full-time ED staff was small.

To tap the broadest range of perspectives, the study included participants with widely varying amounts of ED experience. For physicians, the number of years of ED experience ranged from less than 1 to nearly 40. For nurses, the range was from <1 to 30

years. The average amount of ED experience for physicians was 8.5 years, whereas the average for nurses was 10.6 years. Overall, the focus groups participants brought a combined total of 743.2 years of ED experience to the discussions.

Primary Concerns and Issues

The thematic analysis identified 6 broad categories of concerns that the clinicians expressed in relation to radiological terrorism (Table 3). The concerns were similar across the various focus groups. No major differences were found from region to region or by type of hospital.

TABLE 3

Top Stated Concerns of Hospital Emergency Department Focus Group Participants

Ranking	Total No. Participants Stating Concern	Concern
1	55	Hospital being overwhelmed
2	36	Safety of loved ones
3	26	Possible staffing challenges
4	25	Lack of readiness
5	24	Contamination
6	20	Self-protection

Hospital Being Overwhelmed

By far, the most frequently voiced concern (explicitly stated by 55 of the 77 participants) was that facilities would quickly become overwhelmed in the immediate aftermath of a terrorist incident involving radioactive materials. The clinicians expressed the view that even if members of the public were advised by authorities to shelter in place, people would still flood the hospital:

No one is going to shelter in place. Everyone is coming to the ER right now to figure out if they've been exposed. (Physician)
Shelter in place, they are not going to do it. They are going to come by the droves like rats to cheese. (Nurse)

It is interesting to note that only 5 of the 77 participants indicated that their facilities had a plan for assisting and managing the expected flood of anxious individuals.

Safety of Loved Ones

The second most frequently expressed concern (volunteered by about half of the 77 participants) was the safety of loved ones. Contacting family members right away was seen as critically important:

My first honest reaction would be calling home to let my family know what I knew before I got on with everything else that I needed to do. (Physician)
My first concern would be to call my family to make sure they were OK. Then my second concern would be my place of work. (Nurse)

Possible Staffing Challenges

Nurses and physicians expressed a solid commitment to their professional duties and responsibilities. As one clinician commented, "We are duty-bound" to treat patients unless "your life is in danger from enemy attack and you are no longer of service to those people." At the same time, one third of the focus group participants (26 of 77) expressed strong concern that family needs and related issues could affect staffing levels during a radiological terrorism event. Sometimes, this was seen as a short-term problem:

I think the tendency is for you to lose a lot of capability in the first half hour to an hour of the event, while people are on the phone finding out what was going on with their family. (Physician)

Even though we're all professionals, there would be a real intent to try and get on the phone to get a hold of all my family. (Nurse)

Other clinicians expressed concerns that family issues could have a more significant impact on staffing levels:

I've had staff say that if something came about that they would leave to be with their family. (Nurse)
There would be a lot of hospital staff who would not come to work or who would leave work for concern of their own safety and that of their family. (Physician)

Indeed, some focus group participants, particularly nurses, indicated that their own family responsibilities may make it difficult for them to report to, or stay at, the hospital during a radiological terrorism event:

I'd just go get my kids out of school and stay home and see what else is going to happen. (Nurse)
It's a minute-by-minute decision. Am I staying? Am I going? Where are my kids? Am I picking them up? It's very hard to determine until the actual occurrence has happened. (Nurse)

Lack of Readiness

Beyond potential staffing challenges and issues of the hospital being overwhelmed, one third (25 of 77) of the physicians and nurses in the focus groups expressed more general concerns about what they perceived as a lack of readiness for a terrorist event involving radioactive materials. The threat was seen as unfamiliar, particularly in comparison with other emergency situations:

My staff would be very comfortable with a biological event. Radioactive material, I don't know. (Nurse)
I would be most concerned about the preparedness of the hospital to handle these circumstances. (Physician)
This is where we are most vulnerable. [We are] completely unprepared for any radiological event. (Nurse)

Contamination

In addition to having a general sense of not being fully prepared for a radiological terrorism event, one third of the participants (24 of 77) voiced concerns that EDs and hospitals would be at risk for radiological contamination. The risk, as one nurse explained, was that "something starts coming in before we know that they are radioactive and gets everything dirty." To avoid such a possibility, many of the focus group participants, particularly nurses, argued strongly that an immediate lock-down was essential:

My first concern is locking down the hospital, protecting the employees and the hospital from contamination, because if you lose your hospital, lose your staff, you can't treat anybody. (Nurse)

With the ED in lockdown to avoid potential contamination, triage and care would be handled outside:

First and foremost, we would perform a lock-down. We would actually probably set up the triage in the outside. (Nurse)

Self-protection

Accompanying concerns about the ED and hospital becoming radioactivity contaminated was a high level of uneasiness about personal self-protection. Indeed, 20 of the 77 participants explicitly identified self-protection as a key problem. Although several focus group participants indicated they had some knowledge of appropriate personal protective equipment for radiological events, many more were unsure whether they would be able to adequately protect themselves against potential exposure to radiation or radioactive contamination:

First thing you've got to do is think about our safety. We can't take care of them unless we are protected. (Nurse)

I need to be there to help people, but at the same time, I don't want to expose myself to any kind of risk of radiation. (Physician)

This is not something that if I get exposed there's an antibiotic that I can take. This is all about me and me being safe. (Nurse)

Concerns were exacerbated by uncertainties about what kind of protective clothing was needed and the perception that there was insufficient protective gear and detection equipment available:

Those little white outfits aren't going to help. (Nurse)

There's not enough protective gear to go around. We have a very limited number of protective gear outfits to deal with anything like that. (Physician)

We don't have a Geiger counter. (Nurse)

Concern was expressed that a lack of protective clothing, equipment, or shielding could have a serious impact on patient care:

I can see people being reluctant to go near patients, when they don't have any way of feeling safe. Now there might be some gung-ho people that may or may not do that, but I think a lot of staff will be reluctant unless they feel that they are being taken care of and protected. (Physician)

Finally, with respect to protecting the hospital and hospital staff during an incident of this type, concerns were expressed about what was perceived as a general lack of attention to physical security:

We are, health care is, a target and we are too lax here and it really bothers me. (Nurse)

Security issues are also huge—we just have minimal security. (Physician)

Training and Response Planning

In addition to discussing the hypothetical scenario and identifying what they perceived as the key concerns and challenges, the physicians and nurses commented extensively on a range of training and information issues.

Lack of Radiological Content in Current Training

In considering current training, by far the most commonly expressed view (stated by 24 of the participants) was that preparedness training specifically focused on radiological terrorism was either “not offered at my hospital” or was only offered as a small piece of broader hazardous materials (hazmat) or “all-hazards” training:

We've had actually very little radioactive training. (Nurse)

I don't think there is any training that we are required to take. (Physician)

It's wrapped into a larger hazmat, WMD awareness, for nurses and physicians in the ER. (Nurse)

When asked to estimate how much of the overall disaster training dealt with radiological preparedness issues, 4 nurses in 1 focus group commented in rapid succession: “10% maybe,” “5 minutes,” “30 minutes,” “2 questions on the OSHA (Occupational Safety and Health Administration) exam.”

Lack of Radiological Content in Exercises

The view of clinicians who participated in hospital disaster exercises was that drills tended to emphasize bioterrorism and chemical spill issues rather than radiological terrorism:

Even in a prehospital environment, the training that we get for radiologic incidents is not that high. They focus more on biological aspects. (Nurse)

Response Protocols and Planning

The participants indicated that their facilities did not have guidelines that were specific to radiological threats. Rather, general disaster plans would be used:

I don't think we have a protocol for dealing with radiation exposure. (Physician)

We have a general disaster plan, but not specific to radiation. (Nurse)

Participants commented that details specific to radiation and radioactivity would likely have to be obtained from the radiation safety officer or others with relevant experience in the hospital:

That's pretty much what our plan is if there is a radiological disaster. You call the safety officer that does the radiation and they are going to take care of it. (Nurse)

I don't know what we have over there. A lot of people would have to rely on the radiology department and the radiologists and the nuclear techs . . . (Nurse)

Some of the clinicians, however, were uncomfortable about relying on such arrangements:

We actually have that department that has a Geiger counter. We don't have access to it and the person that does is not a 24-hour response. It's some person in radiology that has it and you have to call them in from home. (Nurse)

Information Needs

The focus group participants identified several types of key information that they would want to have or know about to be able to respond effectively to a terrorist incident involving radioactive materials.

How to Detect Radiation

Several participants indicated that they knew how to use detection equipment, but many others expressed the view that this was an area that was unfamiliar to most ED staff members. "Very few people [in our ED] have used Geiger counters," explained one physician. Consequently, the ED physicians and nurses in the focus groups expressed a need for more knowledge and information about how to detect radiation:

I would like to know what the numbers mean on the Geiger counter, because right now it's Greek. (Nurse)

Don't know much about radiation. (Physician)

We know so little about radiation. (Nurse)

How to Triage Patients in a Radiological Event

Having more information about how to distinguish between people who were exposed or contaminated and those who were not was perceived as vital:

The biggest thing for us is to try to know who is contaminated or not. I mean, obviously the people from the site itself, it's pretty self-evident. But for a lot of the other people or bystanders, I don't think we have a way of knowing who has been exposed, who is radioactive, and who's not. (Physician)

Exposed and those that have not been exposed. Those who hear it and then begin to react as if they were the ones that were exposed. Trying to navigate through all that. (Nurse)

Likewise, it was seen as crucial to have the information needed to distinguish between people who were seriously ill and those who were not:

Signs and symptoms. I need to know, OK, this is serious, take him right back right now. And, OK, you can go and sit in the waiting area; we'll get to you as soon as we can. (Nurse)

None of us have any experience triaging radiation illness. (Physician)

How to Protect Self/Staff

Having more information about self-protection and protection of hospital and staff also was seen as essential:

I want to know how to protect myself and serve my patients at the same time. (Nurse)

I have no idea what would protect me from radiation. (Physician)

One type of information needed for self-protection was how to decontaminate patients in the aftermath of a radiological terrorism event:

Trying to decontaminate people whether that is washing them down, or whatever, and protecting also the people who work in the emergency room. (Physician)

Medical Management

Focus group participants also expressed a need for information about how to treat patients in a radiological terrorism situation:

It's not something that we're used to treating. (Physician)

I don't know what to do for these people. The burn victims I know what to do for, and the inhalation problems, and from the blast itself. If it's radiation I would be looking for someone to tell me what to do for those people. Because they are going to want you to help them, and I wouldn't know how. (Nurse)

I think the challenge would be that we would all be treating a problem that we've only read about. (Physician)

Sources of Information

Focus group participants indicated that during an incident it would be important to have rapid access to additional information. For example, both nurses and physicians stated they would seek out specifics regarding the threat (what kind of radiation, how far away). Although both nurses and physicians stated that their hospital chain of command (including the administration and hospital emergency operations center) would be an important source of information, other sources were sought as well. For nurses, the most frequently mentioned source for additional information was local police, fire, and emergency medical systems (EMS):

I would like to hear it from somebody local. I'd give it a lot more credibility. (Nurse)

Outside Experts Hotline

Both nurses and physicians made it clear that it would be crucial to have immediate access to specialized medical advice and information from outside experts. Several participants mentioned the idea of accessing Web sites:

On the Internet with the CDC, trying to find out what to do with this. (Nurse)

Mentioned far more frequently than the Internet, however, was the idea of a toll-free telephone hotline that could serve as a source of specialized health information:

It would be the same as if a patient came in that had taken something. I call poison control. Poison control tells me what to do and I take care of this patient. (Nurse)

I would want a 1-800 radiation number. (Nurse)

It would be nice to have a hotline we could call 24 hours a day. And they could fax us information that we need. (Physician)

Several clinicians also expressed the hope that outside experts would be available to them on the scene:

I would hope that the CDC by that point would be on a plane coming here. (Nurse)

Usefulness of an ED Pocket Guide

After discussion of the scenario had concluded, focus group participants were given a copy of a draft radiological terrorism

emergency management pocket guide for clinicians. Prepared by the CDC's Radiation Studies Branch, the 10-panel, accordion-fold draft pocket guide contained a brief summary of key protocols for emergency care in a hospital setting following a radiological terrorism incident. Among the areas covered were radiation principles, medical management principles, decontamination guidelines, diagnosis and treatment of radiation-related illness and injury, staff protection guidelines, and management of the deceased. Focus group participants were given an opportunity to review the guide and were then asked to provide feedback.

Clinicians reacted favorably to the idea of having a quick reference pocket guide developed specifically for use in the ED. Indeed, along with the idea of a toll-free hotline, participants indicated that pocket guides were one of the best ways of providing ED staff with essential information on triage and treatment:

I realized that there are a lot of things like principles of radiation that I wasn't quite aware of. (Physician)

It says use standard precautions to protect staff and that was a great relief to me. (Nurse)

Among the subjects that clinicians found most helpful were those dealing with radiation principles and definitions, decontamination, the difference between exposure and contamination, and guidance on staff protection.

To maximize the tool's usefulness, nurses recommended using a flip-book format accompanied by algorithms. "We're just used to algorithms," explained one nurse. Physicians suggested that the guide be complemented by a larger reference manual containing more detailed information or linked to personal digital assistants. To make the pocket guide more "survivable" in an ED setting, focus group participants recommended that it be laminated. Some physicians and nurses thought that the pocket tool could be kept in a toolkit in a known location in the ED and then distributed in the event of a radiological terrorism incident. It also was suggested that the guide be accompanied by a large, laminated ED poster.

Controversy Over Current Guidance

If one aim of the pocket guide discussion was to elicit feedback on its usefulness, another equally important aim was to stimulate discussion of current guidance and protocols for managing radiological terrorism incidents. In this regard, one topic clearly stood out: the advice that "addressing decontamination issues should not delay treatment of life-threatening conditions." The fundamental concept is that risks to caregivers from contamination on the patient's skin are small, and that universal precautions provide staff with protection. Therefore, patient stabilization and lifesaving treatment should take priority over decontamination. This is the "official" guidance for the medical management of radiological terrorism incidents, and can be found on a variety of authoritative Web sites (eg, REAC/TS, the Radiation Emergency Assistance Center and Training Site).

For the nurses and physicians in the focus groups, however, this subject generated strong reactions and intense opinions. Indeed, no other topic discussed in the focus groups generated such a marked level of controversy. Fifteen of the participants—physicians and nurses alike—declared outright that the guidance was wrong:

This is absolutely the wrong thing to do. (Nurse)

This is just 100% wrong. (Nurse)

A similar number stated that the risk of contaminating staff and the facility was too great to ignore contamination issues, regardless of what the guidance said. Furthermore, they argued, the guidance ran counter to other training:

It contradicts a standard of practice. (Nurse)

With all of our disaster training, even if the patient needs to be intubated they get decontaminated first. Then they come in and get treatment no matter how life-threatening their injuries are. (Physician)

We've always been taught in hazmat class that there's a potential—someone could lose their life if they've been exposed. (Nurse)

One in 7 participants explicitly stated that they would not follow this instruction. Many others in the focus groups appeared to agree:

For the safety of others you are not going to contaminate the rest of your staff. (Nurse)

I'm not going to touch him. (Nurse)

You'll be the first one cleared to need the medical treatment, but you're not going to have medical treatment prior to being decontaminated. You're going to have to go through the process before you get that treatment. (Nurse)

DISCUSSION

This is the first major study to examine in detail what ED clinicians think about radiological terrorism and the challenges it poses. As such, it provides a variety of new insights into the perceptions, views, concerns, and information needs of ED physicians and nurses. At the broadest level, focus group participants consistently expressed the belief that neither ED clinicians nor their hospitals are sufficiently prepared for a mass casualty event involving radioactive materials. Current training focusing specifically on radiological terrorism was perceived as minimal, particularly in comparison with training for chemical or biological threats. Knowledge of how to use detection equipment, protect oneself, and triage and treat patients was seen as less than sufficient.

Participants expressed deep concerns about a range of specific issues. Topping the list was the expectation that the hospital would be overwhelmed by a combination of injured people, contaminated people, and people fearful that they had been exposed or contaminated. Given the prominence of this issue, it is striking that only a small number reported that their facilities had specific plans for how to manage and assist large numbers of worried individuals.

The second highest ranked concern for focus group participants related to the safety and well-being of loved ones. Clinicians expressed a powerful commitment to professional duties and responsibilities, but often also indicated that family came first. Furthermore, many participants suggested that family concerns and family needs had a real potential to affect staffing levels. Indeed, some participants, particularly nurses, stated explicitly that they may have to leave the hospital or stay home.

Participants' general sense of being insufficiently prepared for radiological terrorism events is consistent with more general survey-based research. Although such studies do not usually refer specifically to radiological terrorism, they do indicate that only a minority of physicians feel well prepared for bioterrorism and other public health emergencies.¹⁶ The findings also are consistent with other surveys of hospital training, indicating that more attention is devoted to anthrax, smallpox, and chemical agents than is devoted to radiological threats.²⁵

Likewise, the finding that family safety is a major concern during a radiological terrorism event is consistent with survey research studies on health care workers' "ability and willingness to respond." Qureshi et al,¹⁵ for example, found that concern for family was an important factor affecting employees' willingness to respond to a wide range of emergencies. That same study also found that health care workers were less willing to respond to a radiological event than to a smallpox outbreak, an explosion, or a chemical incident.

The present study breaks new ground in identifying ED clinicians' concerns, information needs, and views of current guidance as they relate specifically to radiological terrorism issues. Although a few focus group participants were knowledgeable about radioactive materials and radiological terrorism, many others said that they had what may be described as a low "comfort level" with respect to radiation issues. This likely stems from a combination of factors, including the perceived newness of radiological terrorism threats.⁵ Radiation has also been shown in risk research with the public to be among the most feared of all hazards.^{26,27} Health professionals are not immune to concerns about their personal safety, particularly when they lack confidence in the protective measures that are in place and have had only limited opportunities to practice and prepare through exercises and training.

Focus group participants also expressed strong concerns and uncertainties about contamination and self-protection. Participants believed that they and their facilities would be at high risk for radioactive contamination and seemed to agree that the best way to prevent contamination was to lock down the ED, don protective garments, and use equipment to detect and monitor radiation levels. At the same time, however, the physicians and nurses expressed little confidence that these measures could be taken or would be sufficient due to what was seen as poor physical security, lack of protective

gear and detection equipment, and lack of familiarity with radiological protection measures.

Participants produced an extensive list of critical information needs. These needs included how to detect radiation, recognize a contaminated individual, triage patients arriving at the ED, protect staff from radiation hazards, and provide care for patients. In terms of preferred information sources, the clinicians indicated that the hospital chain of command and local agencies such as EMS would be important sources. Regardless of what local information was available, physicians and nurses indicated it was vital for them to be able to obtain advice on medical management and related topics from outside experts and agencies (eg, the CDC). A toll-free telephone hotline was perceived as the best way to accomplish this.

The draft pocket guide that participants reviewed was greeted favorably. This is not surprising given the overwhelming desire that clinicians expressed for additional training and information. Participants recommended that pocket guides be laminated and kept in the ED as part of a toolkit that could be opened in a radiological terrorism event. It also was suggested that pocket guides be accompanied by a large, laminated poster that could be hung on a wall in the ED.

One of the most important findings to emerge from the study is the fact that significant numbers of clinicians disagree with some current guidance and are not willing to follow it. The guidance, which specifies that patient stabilization and treatment of life-threatening conditions should take precedence over decontamination, provoked strong opposition. One clear source of this resistance stems, ironically, from previous disaster training. In that training, particularly "hazmat" (hazardous materials) training, there is a strong emphasis on addressing contamination issues first. For example, guidance on management of chemical incidents states that if a patient is suspected to be contaminated, decontamination should take place before a patient enters the hospital.²⁸ In other words, the guidance for medical management of radiation incident patients was seen by focus group participants as being diametrically opposed to previous chemical incident training. Many of the clinicians saw the idea of putting treatment of life-threatening conditions before decontamination as unacceptably dangerous to the hospital and its staff.

As with all research, this study has its limitations. First, because the study uses qualitative methods and a nonprobability sample, there is no way to ensure that the data constitute a statistically representative sample of the entire population of US hospital ED physicians and nurses. Thus, there is no way to statistically control variables or extrapolate with precise statistical accuracy. The researchers did, however, use several well-established strategies that can greatly increase confidence in the ability to generalize from the themes, issues, and patterns identified by the research. Among these were the inclusion of participants with widely varying amounts of ED experience, conducting the focus groups in several different US regions, and holding the groups

at hospitals serving various kinds of populations (urban, suburban, and rural).

A second limitation is that nearly all of the nurses who participated in the study described themselves as white. Consistent efforts were made to include minority ED clinicians in the study, and this was successful with respect to the physicians. Unfortunately, however, the nurse participants ended up being ethnically homogeneous. One possible factor is the historical underrepresentation of minorities in nursing, particularly at the RN level.^{28,29} Regardless, future studies of this type would benefit from having more ethnic diversity in their samples.

The study's findings have several clear implications for preparedness and response. First, there is an obvious need to make available to the nation's ED clinicians additional training on the management of radiological mass casualty events. Although all-hazards training provides many transferable skills and competencies, it does not adequately address either the unique challenges or special clinician concerns associated with radiological terrorism. Second, it will be important to better meet the information needs of hospital ED clinicians. Pocket guides, posters, and toolkits being developed by agencies such as the CDC have a valuable role to play in this process. In addition, an authoritative hotline that can provide specialized, trusted expertise on medical management and related issues will be important. Such a hotline must have substantial capability for fielding calls during an incident and should be separate from any hotline created to handle calls from the public. Third, clinicians' concerns for family and loved ones need to be taken into account in planning and preparedness for a radiological terrorism event. Hospitals should anticipate that staff will be focused on concerns for loved ones and ensure that mechanisms are in place to communicate with and address the needs of clinicians' families. Without appropriate attention to such issues, hospitals could face staff shortages in the midst of a radiological emergency. Finally, the conflict between current guidance on the management of radiological terrorism incidents and guidance for hazmat/chemical incidents urgently needs to be addressed. Otherwise, radiological incident guidance may simply be disregarded by clinicians.

Conclusions

Emergency department physicians and nurses will play a vital role in the medical response to any large-scale terrorist incident involving radioactive materials. For preparedness and response efforts to be fully effective, they need to be informed by an understanding of the perspectives of frontline clinicians. This study is the first to examine the views, perceptions, and information needs of hospital ED physicians and nurses regarding radiological terrorism. The findings provide new insights into their concerns and viewpoints, and reveal a range of major preparedness challenges—challenges that must be urgently addressed if hospitals and the nation are to successfully face current and future threats.

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