Nurses and emergency disasters: What is known

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Following the events of September 11, 2001, the threat of bioterrorism events has become a realistic concern for health care workers in the United States. Bioterrorism events caused by infectious agents will be challenging because nurses will need to recognize unfamiliar infections and work long hours with limited resources in stressful conditions. During a bioterrorism event caused by biologic agents, nurses will be expected to provide care to infected patients and may fear that they, or their families, could also become infected. A review of literature suggests that nurses’ response to working during a bioterrorism event is not well described. The limited number of studies regarding nurses’ concerns, fears, and anxieties is focused on nurses’ experiences in natural disaster or war situations. Additional studies are needed to validate the appropriateness of applying findings from disaster response studies to bioterrorism events. During bioterrorism events, nurses will be expected to provide physical care and emotional and psychologic support for victims and victims’ families. Realistic bioterrorism plans should incorporate strategies to support nurses and address their physical, psychologic, and emotional issues. Strategies to optimize safe working conditions and minimize psychologic trauma such as technical training regarding bioterrorism agents and debriefing opportunities should be included. (Am J Infect Control 2006;34:414-20.)

METHODS

Literature searches were conducted in 2 primary databases for English-language articles published in the last 20 years that related to the psychologic implications of disaster work, bioterrorism, and nurses and disaster work. The databases used were Ovid-Medline and PubMed. The World Wide Web was used to find on-line nursing journals, such as Nursing World. Additional literature was collected from experts in the field of bioterrorism preparedness and planning. The search and retrieval of articles took place from July 2002 to August 2004.

Key words used in searching these sources were bioterrorism, bioterrorism and nursing, nursing and terrorism, disaster nursing, response to bioterrorism, disaster response, psychological impact of bioterrorism, and bioterrorism preparedness. The search criterion was limited to articles written in English and published from 1965 to the present. Because this literature review is intended to focus on the anticipated response of nurses working during a bioterrorism event and not on articles on specific biologic agents along with their signs, symptoms, and management, articles of this content were excluded from the review. Additionally, articles that focused only on the effects of disasters or terrorism in civilian populations were excluded.

As articles were collected, they were first scanned to determine applicability and were then summarized and entered into a review table (see Table 1). A total of 21 articles were included in the final table. Articles were screened to determine that they fit into the a
Table 1. Summary of literature and relevant findings

<table>
<thead>
<tr>
<th>Investigator</th>
<th>Design</th>
<th>Relevant findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychologic implications</td>
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<tr>
<td>Schlenger and Jernigan²</td>
<td>Commentary</td>
<td>Emotions resulting from disaster work included fear, sorrow, uncertainty, and anger. These feelings are usually self-limiting. However, clinically significant results may include PTSD and ASD.</td>
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<tr>
<td>Norwood et al³</td>
<td>Commentary</td>
<td>Psychologic consequences of a bioterrorism can be expected to occur in 3 phases: prior to the attack, immediately after the attack, and in the long-term recovery. Adequacy of preparation prior to the attack will determine the degree of psychiatric consequences.</td>
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<tr>
<td>Boxer and Wild⁴</td>
<td>Survey of 147 Firefighters</td>
<td>One third of the firefighters surveyed exhibited symptoms of work-related psychologic distress. Twenty-nine percent reported problems with alcohol use.</td>
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<tr>
<td>Durham et al⁸</td>
<td>Postevent survey of 79 rescue personnel</td>
<td>In response to working as a part of a rescue effort during a laundry room explosion, involved personnel reported fear of personal safety; intrusive, repetitive thoughts about the disaster; and feelings of sadness. PTSD symptoms were higher among on-the-scene workers (28%) than hospital workers (12%).</td>
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<tr>
<td>Butler et al¹¹</td>
<td>Commentary</td>
<td>The response of exposure to a traumatic event will vary for the individuals involved. The majority will experience mild distress responses, such as insomnia, feeling up-set, or worrying, in addition to behavior changes such as increase smoking or alcohol use. A smaller group will suffer more moderate symptoms. Response to traumatic events should focus on normalizing emotional responses and behaviors.</td>
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<tr>
<td>Clohessy and Ehlers⁶</td>
<td>Survey of 56 ambulance workers</td>
<td>Twenty-two percent of the ambulance workers reported experiencing stress while at work. Dealing with incidents of deaths of infants or children was reported most stressful, followed by dealing with relatives of victims.</td>
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<tr>
<td>Duckworth⁵</td>
<td>Postdisaster survey of 234 police officers</td>
<td>Psychologic problems resulting from working during a fire disaster included performance guilt, anxiety generated from reliving the event, generalized irritability, focused resentment, and motivational changes.</td>
</tr>
<tr>
<td>Hodgkinson et al⁷</td>
<td>Postdisaster survey of 67 social workers</td>
<td>Social workers surveyed after providing disaster support for victims following an oil platform explosion and a railroad crash. Increased levels of stress were reported, related to role confusion and identification with victims’ distress, leading to anxiety over competence.</td>
</tr>
<tr>
<td>Holloway et al⁹</td>
<td>Commentary</td>
<td>Physical and safety needs of disaster workers will increase nurses’ workload and contribute to increased psychologic distress. Examples from sarin gas attacks on Japanese subways.</td>
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<tr>
<td>Thorne et al¹²</td>
<td>Focus groups with nonclinical workers</td>
<td>Nonclinical workers who may provide patient care indicated they were fearful of a bioterrorism event. The participants reported they did not feel prepared to work in their expected roles in the event of a bioterrorism attack.</td>
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<tr>
<td>Dworkin et al¹⁰</td>
<td>Case report of anthrax sample submissions</td>
<td>Exemplifies bioterrorism-related anxiety in response to the anthrax cases and exposures in 2001. Describes increased workload and demand for personnel at the Illinois Department of Public Health as a result of a surge in sample submissions.</td>
</tr>
<tr>
<td>Pesik et al¹³</td>
<td>Commentary</td>
<td>During a bioterrorism event, there may be an increased demand for infrequently used supplies, which could lead to a shortage of critically needed supplies and equipment. Resources, including staff, will be overwhelmed by the large number of people seeking treatment with acute injuries, as well as the large number of people who may present demanding prophylactic treatment.</td>
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<td>Working conditions for nurses</td>
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<tr>
<td>Qureshi et al¹⁴</td>
<td>Evaluation of a pilot study of an emergency preparedness training for 53 PHNs</td>
<td>Nurses strongly believed they were responsible for working during an emergency (96%), but only 70% intended to report to work during an emergency in pretest evaluation. Reported barriers to working during an emergency included child/elder care, lack of transportation, and personal health issues.</td>
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<tr>
<td>Shadel et al¹⁵</td>
<td>Focus groups with 150 APIC members</td>
<td>Critical issues identified included infection control practices, triage, and mental health. Nurses also expressed concerns about providing emotional support, managing workloads and providing assistance to other hospital departments.</td>
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<td>Nurses and disaster work</td>
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<tr>
<td>French et al¹⁶</td>
<td>Focus groups with 30 ED nurses following Hurricane Floyd</td>
<td>Primary concerns for nurses included family safety, pet care, and personal safety while at work. Secondary concerns included provisions of basic needs such as food, water, shelter, sleep, and rest. Commitment to remain at the clinical site was variable among the participants.</td>
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<tr>
<td>Sebastian et al¹⁷</td>
<td>Anecdotal report of nurses’ experience during a tropical storm in Houston</td>
<td>Nurses experienced concerns about working conditions, such as food and rest, and reported being on duty for 24 hours. Infection control was also a concern during this experience.</td>
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priori selected categories of psychologic implications of disaster work, nurses’ experience with terror and disaster work, and bioterrorism planning.

RESULTS

Psychologic implications

Experts working in the filed of disaster, such as by Ursano et al, 1 describe the traumatic nature of public health emergencies and identify factors that may influence the experience of nurses working during such events. Their work suggests that there are predictable responses to trauma by both individuals and communities. The way in which those involved experience a traumatic event depends on the nature of the stressors and the mediators associated with the event. The nature of potential stressors includes risk to life, exposure to death and dying, physical injury, duration of the event, loss, and degree of terror. Mediators as described by Ursano et al1 are factors that moderate an individual’s experience of traumatic stress. Examples of mediators are anticipation or worrying about possible events, assessment of the threat, perceived sense of control, role constraint, and prior disaster experience. The perception of the origin or cause of the event, such as man-made versus natural, and the potential for stigmatization of victims also serve as mediators as to how the stressful event will be interpreted by individuals.

Ursano et al1 further describe a climate of anticipatory stress regarding potential disasters that may be a chronic stressor for disaster workers, rescue workers, police, and firefighters. Anticipation of a disaster may also be present in communities in which natural disasters are likely. The anticipatory stress associated with fear of contamination, such as with the use of biologic weapons, is further exacerbated by images of risks to one’s own health and the health of his or her family. This anticipatory stress is further modified by the individual’s assessment of the severity of the threat. These 2 mediators directly influence the individual’s behavior and willingness to remain in, or tolerate, situations in which he or she may be exposed to a threat.

Another mediating variable in disaster situations is the origin of the disaster, either natural or man-made. Natural disasters are generally thought to be outside of human control, whereas a technologic disaster, such as a biologic weapon, is intended to harm and is regarded as preventable. Finally, prior disaster experience is a variable that may be protective during a disaster event.1

A concern related to working during traumatic events is the potential for posttraumatic stress disorder (PTSD). Most people who experience a traumatic event will experience feelings of fear, sorrow, uncertainty, and anger; these feelings are usually self-limiting and last 3 to 6 months. However, some who experience disasters, including disaster workers, will suffer clinically significant reactions, such as acute stress disorder (ASD) and PTSD, major depression, substance abuse, dissociation, somatization disorder, recurrence of endemic psychiatric problems, and psychologic factors affecting their physical condition.2,3

Risk factors that contribute to the development of PTSD include being a woman or member of a minority group, previous experience with a traumatic event, and being young during the time of exposure. Of those who develop PTSD, 20% to 50% will live chronically with

Table 1. (continued)

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<tr>
<td>O'Boyle18</td>
<td>Survey with nurses in critical care and emergency room settings</td>
<td>Nurses indicated they believed working during a bioterrorism event would be chaotic and frightening. Staff issues were also concerning.</td>
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<tr>
<td>Riba and Reches19</td>
<td>Focus groups with Israeli ED nurses</td>
<td>Nurses described feeling pressure to manage their fears in an extremely stressful situation and function in an environment of elevated alertness and anticipation.</td>
</tr>
<tr>
<td>Forgione et al20</td>
<td>Anecdotal report of deployment of OR nurses to Ground Zero</td>
<td>Nurses described the experience of orienting to new units, preparing for mass casualty, and establishing a trauma center. They were required to prepare to work in conditions to which they were not accustomed.</td>
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<tr>
<td>Lukes21</td>
<td>Interview with 3 nurses involved in the events of September 11, 2001</td>
<td>Nurses reported that previous disaster drills did not prepare them for their roles in providing emotional support to persons involved in the terrorist events of 2001. Interventions provided by the nurses consisted primarily of listening to patients’ stories and normalizing the emotions resulting from the events.</td>
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</table>

PTSD, post-traumatic stress disorder; ASD, acute stress disorder; APIC, Association for Professionals in Infection Control and Epidemiology; ED, emergency department; OR, operating room.
worth5 describes several categories of psychologic disturbances, including guilt, anxiety generated from reliving the experience, and worry, and behavior changes such as increased smoking or alcohol use. According to Schlenger and Jernigan, these behaviors are likely to subside, and the individual will recover. A smaller group of those exposed will have symptoms such as persistent insomnia and anxiety. Finally, an even smaller subgroup will develop psychologic illnesses, such as PTSD and major depression, as a result of trauma exposure. The number of individuals who will develop severe psychologic illness following exposure to trauma is directly related to the severity of the trauma and proximity to the victims of the attack.

Psychologic problems and distress are frequently reported in emergency and first responders. Boxer and Wild4 report high levels of work-related psychologic distress among firefighters. Although 59 (41%) of the 147 firefighters in their study had “normal” scores for levels of distress and depression, Boxer and Wild also found that 56 (39%) of participating firefighters had scores suggesting high levels of emotional distress. Overall, as many as one third of firefighters in this study appeared to be suffering from psychologic distress. In a survey of 234 police officers on duty during a 1985 fire disaster in the United Kingdom, Duckworth5 describes several categories of psychologic problems related to the event, including performance anxiety, guilt, anxiety generated from reliving the experience, generalized irritability, focused resentment, and motivational changes.

Stressful events are inherent in the nature of disaster response work. Even situations that may be routine have been found to evoke stress among professional disaster workers. Among 124 ambulance workers, deaths of infants or children received the highest score for stressors, immediately followed by the stress encountered when dealing with relatives of victims.6 Persistent stress has been reported to be more frequent following manmade disasters. Following 2 manmade disasters, an oil production platform explosion and a rail crash, high levels of persistent stress were prevalent among 67 social workers.7 The first source of stress reported by 90% of the social workers was imagining how they would have coped if they had been one of the victims. The second source of stress for 63% of the social workers was that the event allowed earlier unhappy memories to surface. Anxiety about competence resulting from role confusion was reported by 87% of these social workers. Meeting work-related demands and “overworking” was described by 50% of the workers. Significant levels of stress symptoms were reported by social workers in the initial survey, and these levels remained elevated at the 1-year follow-up.7

Of the 79 rescue personnel, including firefighters, emergency medical technicians (EMTs), nurses, other hospital personnel, and police officers who working with victims of an apartment complex explosion, 52% reported feeling some degree of fear for personal safety during the event. Five months following the event, a questionnaire for PTSD was administered to 26 nurses and 53 rescue personnel who had cared for victims or were involved on-the-scene of the disaster. Intrusive, repetitive thoughts about the disaster were reported by 59 (75%) of the respondents, and 34 (44%) reported feelings of sadness. Reports of postrummatic symptoms were higher among on-the-scene workers (50%) than among hospital workers (14%).8

According to Norwood et al.,9 the psychologic consequences of bioterrorism can be expected to occur in 3 phases: prior to the attack, immediately after the attack, and in the intermediate and long-term recovery following from an attack. The adequacy of preparation prior to the attack will determine the degree of psychiatric and societal consequences. Lack of realistic training could contribute to a disorganized and ineffective response that will further heighten fear and reduce trust in institutions that could lead to a cascade of negative societal effects. These authors suggest that it is important for all personnel, including administrative and custodial staff, to participate in training events.

Nurses may experience fear regarding personal safety and will likely work in a chaotic environment during a bioterrorism event. They will be expected to provide care to patients with physical symptoms and to those with psychologic responses to the bioterrorism event. Caring for patients with psychologic symptoms may be challenging because the symptoms may have a multitude of origins, such as the result of infection or biologic toxins and/or the psychologic responses of horror, fear, anger, panic, and paranoia.10

Additional complications may be related to the physical and safety needs of patients and staff. During the sarin gas attacks on the Japanese subway, it was important for emergency health workers to remove and dispose of contaminated clothing and to shower victims. These activities increased nurses’ workload and contributed to fear of contamination. Increased feelings of anxiety and heightened emotional arousal can decrease the staffs’ ability to function in an orderly, thoughtful manner. Although nurses are familiar with isolation protective clothing and equipment, wearing barrier clothing for long periods of time could increase fatigue and overheating for health care workers.9

According to Butler et al.,11 in a terrorist attack, more severe psychologic consequences may result from a perceived lack of control. Perceptions of risk are
influenced by the degree to which individuals feel they have knowledge of, and control over, the event and by the familiarity and seriousness of the events. These authors propose that dangerous or destructive events could “feel” less dangerous if persons have a sense of control over the situation. Focus groups composed of nonclinical workers who may be expected to provide patient care during an attack indicated that workers were fearful of bioterrorism attacks and did not feel prepared to work in their expected roles.12

High levels of bioterrorism-related anxiety were observed after the anthrax cases and exposures in 2001.10 Anxiety influenced by media focus on anthrax caused a sharp increase in the number of powder and nonpowder environmental samples and human blood or tissue specimens submitted between October 8 to December 51, 2001, to the Illinois Department of Public Health’s laboratories. Of the approximate 1500 samples received, none were positive for *Bacillus anthracis*; however, the surge in the number of samples created an unprecedented workload for laboratory personnel. Increased resource utilization can result from anxiety and fear regarding bioterrorism in the community.10

Likewise, an increased demand for infrequently used supplies may easily create a shortage of supplies during a bioterrorism event.13 Demand for resources may quickly exceed supply. It is anticipated that, during a bioterrorism event, there will be an increased need for medical supplies, such as antidotes, antibiotics, antitoxins, and critical care supplies such as ventilators. Hospitals will be overwhelmed by the large number of acute injuries, which will be exacerbated by the large number of people presenting to the hospital demanding prophylactic treatment. This will be a unique factor in bioterrorism events compared with disasters, in which it is clear who has been exposed or affected.

In a 2002 study of public health nurses, 48 (90%) of 53 reported at least 1 barrier to their ability to come to work in the event of a public health emergency.14 Barriers included child/elder care issues, lack of transportation, and personal health issues. Although 96% of nurses believed that they were responsible for working during an emergency, only 70% reported that they intended to work during an emergency.

In focus groups conducted at the Association of Professionals in Infection Control and Epidemiology (APIC) 2000, 150 attendees identified issues including infection control practices, triage, and mental health as critical issues. Epidemiology of bioterrorism pathogens was ranked as the highest educational priority, and participants expressed concerns that nurses would be challenged to provide emotional support to patients and their families, manage workloads, and provide assistance to other hospital departments.15

### Nurses and disaster work

Participants in focus groups conducted with 30 nurses at 4 hospitals after Florida’s Hurricane Floyd revealed that nurses’ primary concerns included family safety, pet care, and personal safety while at work. Secondary concerns included provision of basic needs such as food, water, shelter, sleep, and rest. There was variability in the nurses’ commitment to remain at the clinical site. Although some nurses were highly committed to working, others were more concerned with being home with their families, despite threats to their employment.16

Nurses working during a tropical storm in Houston articulated concerns about working conditions such as food and rest. They described situations in which patients were fed, but nurses were the last to receive food. All staff was required to remain with patients because roads to the hospital were impassable, and some nurses reported being on duty for 24 hours; they worried about their personal health because of a lack of adequate rest. Infection control issues included a lack of water for hand hygiene and access to limited sterile equipment. Nurses reported using equipment in ways that compromised patient safety and violated infection control practices.17

In addition to the current shortage of nurses, hospitals may encounter severe staffing shortages during a bioterrorism event. Focus groups with nurses indicate that nurses believe working during a bioterrorism event will be chaotic and frightening, and some of their colleagues will refuse to remain at the clinical site. Nurses reported concerns of working in conditions with extremely limited resources, and their primary concerns were personal safety and the possibility of transmission of microorganisms to loved ones.18

The impact of treating victims of terror is described by Riba and Reches.19 In focus group interviews with Israeli emergency room nurses who worked terrorism events, the nurses described caring for patients/victims of terror while managing patients’ families and the media. They coped with the stress and exhibited a sense of empathy and control. These emergency room nurses described feeling pressure to manage their fears in an extremely stressful situation and function in an environment of elevated alertness and anticipation. They described feeling a strong commitment to care for the victims of terror. Some nurses in the focus groups described breaking traffic laws and insisting that policemen clear the road for them to get to the hospital to respond to a terrorist event. As they waited for the victims to arrive, they described the situation as very emotional and extremely tense. The experienced nurses were especially afraid because they knew what they were going to encounter. As the victims
began to arrive, the nurses described being on “autopi-
lot.” Their actions became “goal-oriented, stripped of
thought and emotion, consisting of total concentration
on the task at hand and extreme precision in its execu-
tion.” They separated themselves entirely from their
emotions. Their thoughts and feelings remained in
the background and only started to surface as the situ-
ation eased. As soon as the last victim was treated,
the nurses finally began to reveal their emotions.19

A group of operating room nurses working as a part
of the National Disaster Medical System describe their
deployment to New York City to supplement staff at lo-
cal hospitals following the September 11th events. On
arrival, they immediately had to orient themselves to
new units, prepare for mass casualties, and establish
a trauma center in the field. They anticipated the pos-
sibility that they would need to assist with amputations
and other surgical interventions without the equip-
ment and conditions to which they were accustomed.20

Although 3 occupational health nurses working
during the terrorist attacks in 2001 had previously par-
ticipated in disaster drills, they described feeling
inadequately prepared for their role in providing emo-
tional support to persons near the Pentagon or Ground
Zero.21 They provided emotional support to persons by
listening to their client’s stories. They believed listening
was a way to provide care and a mechanism for nor-
malizing the emotions resulting from the event.21

Planning

Planning should incorporate strategies for transi-
tioning nurses from the emergency or crisis roles to
their usual clinical responsibilities. Following terrorist
situations in Israeli in 2002, nurses in focus groups
wanted debriefing sessions with their peers.19 The de-
briefing did not need to be organized, but some time
was needed to be with their colleagues to “clear their
heads.” Closure time for the incident may vary because
nurses needed time to verbalize their thoughts, frustra-
tions, and feelings. The stress of caring for victims of
terrorist events was lingering, and, depending on the
extent of the terrorist event, some nurses continued to
report restlessness, sleeplessness, and nightmares.

Although sharing emotional responses with col-
leagues may be therapeutic, it may not be enough for
nurses to return to normalcy. To prevent accelerated
burnout and secondary trauma, nurses will need suffi-
cient rest periods, emotional support, and opportuni-
ties to “get away from it all.”21

Nurses working during Florida’s Hurricane Floyd
suggested the need for policies addressing work assign-
ments; financial compensation; and personal issues
such as pet care, family sheltering, and provision of
basic needs.16 They also desired security, stability,
and equality during disaster situations. After summa-
rizing the nurses concerns and needs, the authors
reviewed the hospitals’ disaster plans and found that
the disaster plans of the involved hospitals did not
address the concerns of nurses related to food, water,
blankets, beds, or clothing (scrubs).

A bioterrorism event will create unique issues for
nurses, including the need for self-protection, the chal-
lenge to manage staff, and the decisions about the
role of nurses in the use and allocation of critical
resources.22 Nurses also want to be assured that their
personal protection is an institutional priority.

DISCUSSION

There are limitations in the research about variables
that may influence nurses who are expected to work
during a bioterrorism event. The studies that are used
to approximate working conditions in a bioterrorism
event describe the experiences of nurses working dur-
ing natural disasters, multicasualty terror, or the events
of September 11, 2001.16,17,19-21 Additionally, of the
bioterrorism planning articles selected for this review,
one include opinions of nurses.

Published reports relevant to nurses working during
a bioterrorism event include the studies of the psychologic effects of emergency and disaster work. The dif-
ference in working conditions between nurses and
first responders limits the application of these findings
to nurses. Whereas the primary role of first responders
is on-site stabilization and treatment, as well as trans-
port of victims, nurses’ primary work focuses on sust-
aining the health of victims. Because nurses may
spend greater amounts of time with victims, the risk
of exposure to bioterrorist agents may be increased.

Therefore, it is anticipated that nurses will experience
challenging working conditions, including an envi-
ronment of fear, as well as difficult infection control
requirements. Additionally, the focus of these stud-
ies has been on the development of psychologic prob-
lems following traumatic events, primarily PTSD.
These studies do not identify elements that will sup-
port the function of nurses working in these challeng-
ing environments.

The most frequently used study design is postevent
questionnaires, usually given 1 month to 1 year fol-
lowing the event. Immediate postevent data collection
may be flawed because of the environmental chaos
and delayed reaction of mental health sequelae to
the event. Natural disasters are more likely to result
in an immediate reaction to a crisis situation, whereas
responses to a bioterrorism event may have a delayed
manifestation. The applicability of studies of nurses
responding to natural disasters to the unique reaction
of nurses in a bioterrorism event is tenuous. In
addition, recommendations for bioterrorism preparedness based on expert opinion or anecdotal reports are not evidence based and will need to be addressed in future research.

The response of nurses during and following a bioterrorism event is not well described. There are limited data available regarding the concerns and fears nurses have about their clinical role and working conditions during a bioterrorism event. Nurses will likely be expected to function in chaotic work environments and provide direct care to victims infected with unusual or genetically altered infectious microorganisms. The stress of these working conditions will be amplified by the nurses’ feelings of anxiety and fear for themselves and their families. Adequately training and preparing nurses for bioterrorism events is essential to optimize safe functioning and minimizing emotional and psychologic trauma.

References