Special Articles

Domestic Terrorism With Chemical or Biological Agents: Psychiatric Aspects

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Objective: This article highlights the mental health consequences of a domestic terrorist incident involving chemical or biological weapons. **Method:** The author reviews the literature on the neuropsychiatric effects of selected chemical and biological weapon agents, on the psychological sequelae of mass disasters, and on approaches to crisis intervention. **Results:** Disturbances of behavior, affect, and cognition can result directly from the pharmacological actions of some chemical and biological weapon agents. In addition, an incident involving these agents can have considerable psychological effects on individuals and the community. In either case, some disorders are acute and others are prolonged or delayed in onset. Effective therapeutic intervention involves a broad range of clinical, social, and administrative actions. **Conclusions:** Psychiatrists have an important role in the management of a chemical or biological terrorist incident and, along with their other medical colleagues, should train and prepare for it.

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No significant criminal (including terrorist) use of chemical or biological weapons has yet occurred in the United States. However, acquisition, delivery, and targeting of these weapons are within the grasp of any determined and skilled individual or group. During the winter of 1995–1996, federal law enforcement authorities arrested a man in Arkansas who had produced ricin (a potent toxin from the bean of the castor plant); they also arrested members of a group in New York City who were acquiring ingredients to manufacture sarin, a nerve agent. In March 1995 the Aum Shinrikyo cult used sarin in the Tokyo subway system to kill 12 people and cause 5,510 people to seek medical care. In preparation for this attack, the same group field-tested its manufactured sarin in central Japan a year earlier, killing seven and injuring 200.

In all likelihood, any incident involving a chemical or biological device will be handled initially by local personnel and institutions at the site. Medical preparations for this event, if made at all by hospitals, may not involve psychiatrists or may rely on assumed but untested "psychiatric assistance." Yet disorders of mood, cognition, and behavior will be among the more common findings in the exposed, or possibly exposed, population because of the uncertainty, fear, and panic that may accompany the incident and the pharmacology of the agents themselves. Persons with altered behaviors may be so numerous that they overwhelm available medical resources, whether the incident involves a high concentration of an effectively delivered agent, an attack that is ineffective because of low concentration and/or poor delivery (as was the case in the Tokyo attack), or just a hoax that takes on a momentum and life of its own.

Psychiatrists who are called on to assist in a chemical or biological incident will encounter anxiety, fear, panic, somatization, and grief at the individual and community levels. They may be expected to advise local civil defense officials about the management of a pan-

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icked population and to offer guidance to the suddenly swamped staffs of their hospitals' emergency rooms. They will have to provide crisis intervention to health care workers and first responders who sustain "battle" fatigue while performing their duties. They may also be asked to assist in the mental status evaluations of persons who have been exposed to certain chemical or biological agents in order to perform triage to differentiate those whose psychiatric symptoms are the result of somatization or anxiety from those with agent-induced alterations. And they will be expected to treat, immediately and over the long term, persons with psychiatric disorders of whatever etiology that result from this incident. In this article I will examine these various issues and offer suggestions to help psychiatrists prepare to assume these responsibilities.

EFFECTS OF CHEMICAL AND BIOLOGICAL AGENTS ON MENTAL STATUS

Whether from a biological or chemical agent attack, many people, exposed or not, who seek treatment in emergency rooms will exhibit tension, tachycardia, increased respiratory rate, tremors, and other nonspecific signs and symptoms that could result from the agent or from anxiety associated with the incident. In the absence of clearly pathognomonic features, patients run the risk of either a delay in important therapy or administration of unnecessary medications, e.g., atropine in the absence of exposure to a nerve agent, that could create serious side effects. When physical signs and symptoms are ambiguous, mental status findings, especially the finding of delirium and the distinction between the anxieties seen in delirium and the anxieties seen in panic, may be crucial in the differential diagnosis.

Nerve agents have the greatest potential among chemical weapons for causing confusion in diagnosis. These are organophosphorus compounds that, through phosphorylation of acetylcholinesterase, produce enzyme inhibition and the accumulation of acetylcholine at the terminal endings of all postganglionic parasympathetic nerves, at neuromuscular junctions, and in the autonomic sympathetic and parasympathetic ganglia. The principal nerve agents are sarin, tabun, soman, and VX.

In the 1950s and 1960s, studies with human volunteers documented effects of nerve agents or similar organophosphate compounds on mental status. In some studies the volunteers were not told what to expect. In one study (1) the degree of reduction in acetylcholinesterase blood levels correlated with the number of subjects who experienced intellectual impairment, anxiety, psychomotor retardation, and disturbed sleep patterns. Psychological disturbances were more prominent than physical signs and symptoms even when acetylcholinesterase levels were reduced 60%–90% (1).

In four persons accidentally exposed to sarin and one person exposed to soman while working in a military laboratory (2), depressed mood, social withdrawal, insomnia with unpleasant dreams, and "antisocial thoughts" persisted for several weeks in the two most severely intoxicated. Early neuropsychological testing revealed deficits in visual retention, word association, and proverb interpretation, with improvement 6 months later. In a less intoxicated person, emotional lability developed during the first 2 days after exposure; at 4 months he was easily fatigued and had nonspecific pain, depressed mood, and restlessness (2).

Following intravenous administration of VX to volunteers, investigators noted diminished ability to perform mathematical tests at 1 hour postinjection, with rapid recovery thereafter (3). A person exposed percutaneously to VX during an attempt to murder him had persistent anterograde and retrograde amnesia when discharged from the hospital 15 days after the incident (4).

Acute effects of exposure to organophosphate pesticides by persons who attempted suicide and among accidentally exposed livestock workers and farmers included impaired vigilance and concentration, memory deficits, slowing of information processing and psychomotor speed, slowing of speech, word-finding difficulties, depression, anxiety, and irritability (3, 5–8). The degree of depression, measured on depression symptom rating scales, and the degree of diminished memory correlated with the degree of acetylcholinesterase inhibition.

Persistent long-term neuropsychiatric effects of acute intoxication with this class of pesticides include drowsiness, memory impairment, depression, fatigue, and increased irritability, and the symptoms last weeks to years after the exposure. In some persons, long-term changes in auditory attention, visual memory, motor speed, and problem-solving ability may be missed on routine clinical examinations but are detectable by neuropsychological testing (9, 10).

Of the drugs associated with the management of nerve agent exposure, atropine has the most potential for serious alterations in mental status. Most civilian physicians are accustomed to using atropine in doses under 2 mg, but treatment of patients exposed to acetylcholinesterase inhibitors may require 60–100 mg just in the first 24 hours. Given in excess of the patient's needs, atropine can produce psychiatric side effects ranging from drowsiness to hyperactivity, hallucinations, and coma (11–13).

Blister agents (nitrogen or sulfur mustards), another class of chemical weapons, can produce delirium (14, 15) and psychological distress resulting from highly disfiguring lesions that cover the skin, including genitalia, and from long-lasting oligospermia (16, 17).

Potential biological weapon agents include anthrax, botulinum, tularemia, plague, brucellosis, Q fever, smallpox, the viral encephalitides, viral hemorrhagic fevers, and staphylococcal B enterotoxin. Delirium is possible with all these agents. The viral encephalitides can also produce long-term cognitive impairment and alterations in mood. Anthrax spores can produce rapidly progressive meningitis. Depression, irritability,

and headaches occur in persons with brucellosis, and nearly all fatalities from this infection involve either the endocardium or the central nervous system. About one-third of patients with Q fever complain of malaise and easy fatigue, and in more advanced disease they can develop encephalitis with hallucinations (18). Botulinum toxins result in a progressive paralysis, with delayed recovery of muscle power; survivors may require months of care with a ventilator and may become demoralized and depressed.

PSYCHOLOGICAL IMPACT

A chemical or biological incident will produce psychological impairment at the individual and community levels and may generate numbers of casualties that overwhelm local medical resources.

An incident with these weapons will be unlike any disaster known to most Americans. Usually, disasters do not produce panic because they involve familiar phenomena that are time limited and discernible to those involved in them. People in fires, for example, generally act responsibly, even altruistically, because they know about fires and receive sensory cues that enable them to assess the threat and to plan their escape (19). However, a chemical or, even more so, biological incident poses a sudden, unanticipated, and unfamiliar threat to health that lacks sensory cues, is prolonged or recurrent, perhaps is contagious, and produces casualties that are observed by others. These are the factors that, historically, have spawned fear, panic, and contagious somatization.

A chemical or biological attack is psychological warfare, whether that attack is real or a cleverly designed hoax and whether it is initiated by a lone sociopath, by a group of domestic or foreign terrorists, or by a nation. How others have responded to such attacks may predict how Americans might react. After the first missile attack on Israel by Iraq during the Persian Gulf war, nearly 40% of the civilians in the immediate vicinity of the attack had breathing difficulties, tremors, sweating, anxiety, and labile mood; subsequent attacks produced fewer symptoms (20). In a World War I incident, of 281 soldiers admitted to a referral center field hospital, 90 were true gas casualties and the rest were victims of "gas mania" (21). Of the 5,510 persons who sought medical treatment from the 1995 sarin attack in Tokyo, 12 died, 17 were critically injured, 1,370 had mild to moderate injuries, and the other 4,000 had no or minimal injuries.

Similar reactions have followed toxic spills and even rumors of "something bad" in the air.

In February 1973 a ship containing 50 drums of a relatively harmless organophosphate defoliant encountered rough seas and docked at Auckland, New Zealand, where several drums were unloaded. During the unloading, a wharf foreman noted a "sickly" odor coming from somewhere aboard the vessel and also noted the word "poison" on one of the drums. Over the next several hours, a mixture of misinformation and garbled translations contributed to a declaration of a state of civil emergency by the government and the evacuation of the area downwind from the incident. By the time the incident ended, 643 patients had sought medical care. Postincident analyses showed that the offending agent was relatively low in toxicity and, at most, had affected 241 workers who had come in direct contact with it, none of whom had sufficient exposure to reduce their acetylcholinesterase levels. The other 400 persons "were treated for symptoms suggestive of either their own anxiety or that of someone else" (22).

Somatization disorders affecting 784 schoolchildren in separate incidents in the continental United States and Alaska (23–26) and 949 people over three districts in the West Bank (27) all resulted from reports of "gas." Operations were curtailed at a Midwestern U.S. university data processing center (28) and at a U.S. electronics assembly plant (29) because of epidemics of somatization produced by fears of "gas poisoning." "Psychological stress reaction" was suspected, but not established, as the cause of collapse of six workers at a California hospital who complained of "ammonia-like fumes" after blood was drawn from a patient they were attending (30). Fear of "toxic gas" produced psychogenic symptoms in approximately 1,000 male U.S. military recruits in California in 1988 (31). Many of these episodes were halted with reassurance and dispersal of the affected populations.

Other psychological reactions to a disaster can affect anyone involved: acute stress disorder, grief, anger, scapegoating (anger directed at people perceived to have contributed to, or profited from, the disaster), and guilt at having done too little to have helped others. Longer-term effects include phobias, sleep disorders, posttraumatic stress disorder, substance abuse, and major depression (32, 33). When a disaster destroys a community, with dislocation and relocation of its members, additional stresses result from the loss of dignity as residents are forced into public shelters and experience the anxiety of strange environments and the disruption of their social networks (34).

There is little reason to believe that medical personnel (including ancillary staff, e.g., housekeepers, central supply workers), inexperienced and perhaps untrained in chemical and biological incidents, will be spared from the anxiety and other psychological distresses that will afflict the rest of the community, particularly if the offending agent threatens their own families. As Raphael noted, as victims and helpers emerge from a disaster, their "roles and experiences may be changed and interwoven so that the distinction between [them] has little meaning" (34, p. 222). Medical and rescue workers may not seek and may even resist therapeutic intervention for themselves (35).

CLINICAL COURSE

Survivors of any disaster may need prolonged care. Of 111 patients hospitalized at one Tokyo hospital after their exposure to sarin during the subway attack, one-third reported anxiety, fear, nightmares, insomnia, and irritability to their physicians. At 1 month after the incident, 32% of the patients treated at that hospital after the incident reported a fear of subways, 29% noted continuing sleep disturbances, and 16% reported flashbacks and depression. These symptoms persisted at 3- and 6-month follow-up visits to their physicians (36).

Two weeks after the 1979 partial meltdown of the reactor core at the Three Mile Island nuclear power plant, which released a half-mile-wide plume of radioactive steam into the atmosphere, 26% of the local population showed severe demoralization. Eighteen months later the residents reported significantly greater emotional stress, more global symptoms and somatic complaints, and higher levels of anxiety and alienation than control groups (37). Long-lasting psychological effects have also followed transportation accidents (38) and natural disasters (39).

Tyhurst (40) noted three phases in the course of a community's response to disaster. The first, or "impact," stage is the time from the onset of the acute stressors until they are no longer operant. During this period, 12%–25% of disaster victims are able to analyze the dangers, formulate a plan, and act on it. About 75% are stunned and bewildered, and the remaining 10%–25% become confused, paralyzed by fear or anxiety, or hysterical (34). During the second stage, a "period of recoil," which begins when the initial stresses have ceased or when the person has escaped, those involved have a great need to be with others and talk (40, 41). It is during this stage that one form of crisis intervention, the critical incident debriefing (discussed later), may be initiated. During the final posttrauma stage, survivors realize what they have lost and the trauma they have experienced. Promises of aid and assistance that are made to a disaster-hit community by various agencies may lead to additional stress because of disappointment over unfilled or misunderstood promises and frustration with delays in receipt of aid (42).

THERAPEUTIC INTERVENTIONS

To help victims reduce their likelihood of developing postdisaster psychiatric disorders, therapists have developed several crisis intervention techniques, including psychological debriefing, for implementation within hours or days after the incident. Although some investigators question the value of these debriefings (43), others believe they are effective in reducing later posttraumatic symptoms (38, 44, 45).

All crisis intervention incorporates certain principles. The therapist should be flexible in addressing the broad spectrum of reactions that may be encountered. Injured and frightened survivors should not be left alone, and parents should be reunited with their children. Providing survivors with blankets and food helps reassure them that someone is concerned about them. Survivors should be encouraged to verbalize their experiences; they may be able to do this better in a group setting than one-on-one (46). Persons with significant psychiatric disorders should be referred for hospitalization. As soon as possible, disaster survivors should be encouraged to participate in simple but useful tasks (32).

Many psychological debriefing techniques follow the reconstructive historical debriefing model developed by Marshall during World War II (47). In general, they allow the survivors to discuss what they experienced and what they felt. In the process, misperceptions may be clarified. Education on the range of expected emotional responses to a traumatic event is provided, and continuing help is offered. These debriefings are provided to anyone directly or indirectly exposed to the critical incident, including their relatives (48–50).

Some therapists have used a mini-marathon model that takes about 3 hours, can involve as many as 300 participants at one time (with enough therapists and microphones), and includes story and symptom sharing (51). Another debriefing technique currently being taught at seminars around the United States, particularly to nonpsychiatrists, is eye movement desensitization and reprocessing, which combines the recollection of painful events and their emotional charge with directed eye movements (52).

DISASTER PREPARATIONS

The psychiatrist should review his or her hospital's mass disaster response plan to ensure that the mental health component is more than token. It should include the establishment of a command-and-control center that will coordinate the services of mental health staff and volunteers to use their varied skills, ensure quality control, avoid disagreements among service providers, and reduce the possibility of overlapping services (35, 53, 54). The center could also assign service providers to areas where they are needed within the hospital, at the crisis site, and at shelters and community agencies (where injured victims are) and avoid congestion elsewhere. Community mental health centers could also serve as control points for care delivery (55).

The disaster plan should anticipate alternative forms of communication, including runners if telephone systems malfunction or become overcrowded. In a mass disaster the media may be scanning cellular telephone frequencies, and sensitive information should be transmitted by other means, such as hard-wired telephones.

Any disaster response plan should be coordinated with regional medical facilities and local law enforcement and civil defense agencies. This coordination process could serve as a vehicle by which the psychiatrist can educate others about the potential impact of psy-

chological casualties on the community, the spectrum of normal-to-abnormal emotional reactions that may occur, and crisis intervention techniques.

Communication with the public by print media and by television and radio is crucial in a disaster (56). There should be a policy for handling media requests for interviews with local psychiatrists, whose messages must be consistent with ongoing events. It would not be helpful, for example, to tell the public that the danger is minimal if, at the same time, they are watching television footage of armed security forces in full chemical or biological protective clothing. Trust and credibility are key components of communication regarding environmental risk (57).

Thought should be given before a disaster strikes on how to keep adequate psychiatric patient records during the crisis (35) and how to implement an efficient institutional review board procedure for quickly reviewing and approving research projects to capture the experiences learned from the incident.

Whether through self-study or attendance at courses, psychiatrists should become familiar with the effects of, and treatment for, the chemical and biological agents that may be used in a terrorist incident. They should also familiarize themselves with decontamination procedures. In the crisis atmosphere that would be likely in the event of a chemical or biological incident, cohesive teamwork among all members of the medical staff is essential for both efficiency and safety. That quality of teamwork will result only from group training, and psychiatrists should be included in that training.

Psychiatrists will be consultants in a chemical or biological incident, but their environment may be hazardous. Medical personnel who come into initial contact with victims who have not been thoroughly decontaminated will need to wear protective clothing, including a "gas mask." Working effectively while wearing this clothing requires training and considerable practice. Military personnel, including medical, who were observed while in protective clothing without adequate prior practice experienced altered cognition, apprehension, hyperventilation, and claustrophobia that interfered with duty performance (58, 59). Even with experience, personnel who work in this type of protective clothing find their reaction times slowed. Fatigue, dehydration, and even heat exhaustion are risks. Therefore, shortened shift work, frequent rest periods, and duty rotations should be anticipated.

CONCLUSIONS

Remote though the possibility of a terrorist-authored chemical or biological incident in an American community may be, we must prepare for one. The agents are too easy to acquire or manufacture and too easy to disperse for us to ignore that possibility. Even the relatively more likely hoax or attack with an agent of low concentration that is ineffectively delivered will still generate mass casualties that will threaten civil order and inundate community medical facilities. The creation of this chaos is as much within the grasp of a lone, skilled, and determined person with his or her own warped agenda as it is of state-sponsored terrorists.

Many, perhaps most, persons involved in such an incident will exhibit fear, anxiety, or more serious disorders of mood, behavior, or cognition, especially if the perceived threat is a biological weapon that can spread silently from person to person. Local psychiatrists have a multifaceted role in their communities' disaster response plans. That role includes immediate treatment of individual patients and groups of patients who are experiencing the psychological impact of a mass disaster, organizing and managing the delivery of mental health care by others to the community, and assisting local medical facilities and community leaders in the control of widespread anxiety, fear, and perhaps even panic.

Should the weapon agent produce mental status changes that overlap those of psychiatric disorders, the psychiatrist's carefully done mental status examination may be crucial to triage and the prompt delivery of medical treatment to those who need it. Beyond the immediate crisis, any chemical or biological incident will likely produce delayed and chronic psychiatric disorders, as psychological effects of the disaster or as sequelae of the pharmacology of the agent itself.

In the absence of experience, confidence in handling this crisis will come from training and solid planning.

REFERENCES

1. Bowers MB, Goodman E, Sim VM: Some behavioral changes in man following anticholinesterase administration. J Nerv Ment Dis 1964; 138:383–389
2. Sidel FR: Soman and sarin: clinical manifestations and treatment of accidental poisoning by organophosphates. Clin Toxicol 1974; 7:1–17
3. Eyer P: Neuropsychopathological changes by organophosphorus compounds—a review. Hum Exp Toxicol 1995; 14: 857–864
4. Nozaki H, Aikawa N, Fujishima S, Suzuki M, Shinozawa Y, Hori S, Nogawa S: A case of VX poisoning and the difference from sarin (letter). Lancet 1995; 346:698–699
5. Minton NA, Murray VS: A review of organophosphate poisoning. Med Toxicol Adverse Drug Exp 1988; 3:350–375
6. Levin HS, Rodnitzky RL: Behavioral effects of organophosphate in man. Clin Toxicol 1976; 9:391–403
7. Feldman RG, Ricks NL, Baker DL: Neuropsychological effects of industrial toxins: a review. Am J Ind Med 1980; 1:211–227
8. Mearns J, Dunn J, Lees-Haley PR: Psychological effects of organophosphate pesticides: a review and call for research by psychologists. J Clin Psychol 1994; 50:286–294
9. Jamal GA: Long-term neurotoxic effects of organophosphate compounds. Adverse Drug React Toxicol Rev 1995; 14:85–99
10. Steenland K, Jenkins B, Ames RG, O'Malley M, Chrislip D, Russo J: Chronic neurological sequelae to organophosphate pesticide poisoning. Am J Public Health 1994; 84:731–736
11. Headley DB: Effects of atropine sulfate and pralidoxime chloride on visual, physiological, performance, subjective, and cognitive variables in man: a review. Mil Med 1982; 147:122–132
12. Longo VG: Behavioral and electroencephalographic effects of atropine and related compounds. Pharmacol Rev 1966; 18: 965–966

13. Wadia RS, Sadagopan C, Amin RB, Sardesai HV: Neurological manifestations of organophosphorus insecticide poisoning. J Neurol Neurosurg Psychiatry 1974; 37:841–847
14. Colardyn F, de Keyser H, Ringoir S, de Bersaques J: Clinical observation and therapy of injuries with vesicants. J Toxicol Clin Exp 1986; 6:237–246
15. Pauser G, Aloy A, Carvana M, Graninger W, Havel M, Koller W, Mutz N: Lethal intoxication by wargases on Iranian soldiers: therapeutic interventions on survivors of mustard gas and mycotoxin immersion. Arch Belg Suppl 1984, pp 341–351
16. Borak J, Sidel FR: Agents of chemical warfare: sulfur mustard. Ann Emerg Med 1992; 21:303–308
17. Azizi F, Keshavarz A, Roshanzamir F, Nafarabadi M: Reproductive function in men following exposure to chemical warfare with sulphur mustard. Med War 1995; 11:34–44
18. Franz DR, Jahrling PB, Friedlander AM, McClain DJ, Hoover DL, Bryne WR, Pavlin JA, Christopher GW, Eitzen EM Jr: Clinical recognition and management of patients exposed to biological warfare agents. JAMA 1997; 278:399–411
19. Bryan JL: Human behavior and fire, in Fire Protection Handbook. Edited by Cote AE. Quincy, Mass, National Fire Protection Association, 1986, pp 1-17–1-31
20. Carmeli A, Liberman N, Mevorach L: Anxiety-related somatic reactions during missile attacks. Isr J Med Sci 1991; 27:677–680
21. Defense Technical Information Center: Meeting the Chemical Threat: Psychiatric Casualties in a Chemical Environment: Report P004081. Washington, DC, Defense Technical Information Center, 1980
22. McLeod WR: Merphos poisoning or mass panic? Aust NZ J Psychiatry 1975; 9:225–229
23. Small GW, Borus JF: Outbreak of illness in a school chorus: toxic poisoning or mass hysteria? N Engl J Med 1983; 308: 632–635
24. Feinberg DT, Steinberg D, Collins MT: A sudden outbreak of illness suggestive of mass hysteria in schoolchildren. Arch Fam Med 1994; 3:711–716
25. Taylor BW, Werbicki JE: Pseudodisaster: a case of mass hysteria involving 19 schoolchildren. Pediatr Emerg Care 1993; 9: 216–217
26. Selden BS: Adolescent epidemic hysteria presenting as a mass casualty, toxic exposure incident. Ann Emerg Med 1989; 18:892–895
27. Modan B, Swartz TA, Tirosh M, Costin C, Weissenberg E, Donagi A, Acker C, Revach M, Vettorazzi G: The Arjenyattah epidemic, a mass phenomenon: spread and triggering factors. Lancet 1983; 2:1472–1474
28. Stahl SM, Lebedun M: Mystery gas: an analysis of mass hysteria. J Health Soc Behav 1975; 15:44–50
29. Colligan MJ, Urtes MA, Wisseman C, Rosensteel RE, Anania TL, Hornung RW: An investigation of apparent mass psychogenic illness in an electronics plant. J Behav Med 1979; 2: 297–309
30. Brown SD: In the wake of disaster: stress, hysteria, and the event, in Ideas of Difference: Social Ordering and the Labour of Division. Edited by Hetherington K, Munro R. Oxford, England, Blackwell, 1997, pp 64–87
31. Struewing JP, Gray GC: An epidemic of respiratory complaints exacerbated by mass psychogenic illness in a military recruit population. Am J Epidemiol 1990; 132:1120–1129
32. Singer TJ: An introduction to disaster: some considerations of a psychological nature. Aviat Space Environ Med 1982; 53: 245–250
33. Ursano RJ, Fullerton CS, Norwood AE: Psychiatric dimensions of disaster: patient care, community consultation, and preventive medicine. Harvard Rev Psychiatry 1995; 3:196–209
34. Raphael B: When Disaster Strikes: How Individuals and Communities Cope With Catastrophe. New York, Basic Books, 1986
35. Anteau CM, Williams LA: What we learned from the Oklahoma City bombing. Nursing 1998; 28:52–55
36. Ohbu S, Yamashina A, Takasu N, Yamaguchi T, Murai T, Nakano K, Matsui Y, Mikami R, Sakurai K, Hinohara S: Sarin poisoning on Tokyo subway. South Med J 1997; 90:587–593
37. Smith EM, North CS, Price PC: Response to technological accidents, in Mental Health Response to Mass Emergencies: Theory and Practice. Edited by Lystad M. New York, Brunner/Mazel, 1988, pp 52–95
38. Dalgleish T, Joseph S, Thrasher S, Tranah T, Yule W: Crisis support following the Herald-of-Free-Enterprise disaster: a longitudinal perspective. J Trauma Stress 1996; 9:833–845
39. Parker G: Psychological disturbance in Darwin evacuees following Cyclone Tracy. Med J Aust 1975; 1:650–652
40. Tyhurst JS: Individual reactions to community disaster: the natural history of psychiatric phenomena. Am J Psychiatry 1951; 107:764–769
41. Strumpfer DJW: Fear and affiliation during a disaster. J Soc Psychol 1970; 82:263–268
42. Cohen R, Culp C, Genser S: Human Problems in Major Disasters: A Training Curriculum for Emergency Medical Personnel. Washington, DC, US Government Printing Office, 1987
43. Deahl MP, Bisson JI: Dealing with disasters: does psychological debriefing work? J Accid Emerg Med 1995; 12:255–258
44. Chemtob CM, Tomas S, Law W, Cremniter D: Postdisaster psychosocial intervention: a field study of the impact of debriefing on psychological distress. Am J Psychiatry 1997; 154: 415–417
45. Joseph S, Yule W, Williams R, Andrews B: Crisis support in the aftermath of disaster: a longitudinal perspective. Br J Clin Psychol 1993; 32:177–185
46. Carlton TG: Early psychiatric intervention following a maritime disaster. Mil Med 1980; 145:114–116
47. Marshall SLA: Men Against Fire: The Problem of Battle Command in Future War. Gloucester, Mass, Peter Smith, 1978
48. Cigrang JA, Pace JV, Yasuhara TT: Critical incident stress intervention following fatal aircraft mishaps. Aviat Space Environ Med 1995; 66:880–882
49. Budd F: Helping the helpers after the bombing in Dhahran: critical incident stress services for an air rescue squadron. Mil Med 1997; 162:515–520
50. Davis JA: Sadness, tragedy and mass disaster in Oklahoma City: providing critical incident stress debriefings to a community in crisis. Accid Emerg Nurs 1996; 4:59–64
51. Terr LC: Mini-marathon groups: psychological “first-aid” following disasters. Bull Menninger Clin 1992; 56:76–86
52. Shapiro F: Eye Movement Desensitization and Reprocessing: Basic Principles, Protocols, and Procedures. New York, Guilford Press, 1995
53. Tucker P, Pfefferbaum B, Vincent R, Boehler SD, Nixon SJ: Oklahoma City: disaster challenges mental health and medical administrators. J Behav Health Serv Res 1998; 25:93–99
54. Jacobs GA, Quervillon RP, Stricherz M: Lessons from the aftermath of flight 232. Am Psychol 1990; 45:1329–1335
55. Lystad M: Perspectives on human response to mass emergencies, in Mental Health Response to Mass Emergencies. Edited by Lystad M. New York, Brunner/Mazel, 1988, pp xvii–xviii
56. Holloway HC, Norwood AE, Fullerton CS, Engel CC Jr, Ursano RJ: The threat of biological weapons: prophylaxis and mitigation of psychological and social consequences. JAMA 1997; 278:425–427
57. Peters RG, Covello VT, McCallum DB: The determinants of trust and credibility in environmental risk communication: an empirical study. Risk Anal 1997; 17:43–54
58. Carter BJ, Cammermeyer M: Biopsychological responses of medical unit personnel wearing chemical defense ensemble in a simulated chemical warfare environment. Mil Med 1985; 150:239–249
59. King JM, Frelin AJ: Impact of the chemical protective ensemble on the performance of basic medical tasks. Mil Med 1984; 149:496–501