

The Spectrum of Human Reactions to Terrorist Attacks with Weapons of Mass Destruction: Early Management Considerations

Cleto DiGiovanni, Jr., MD

Institute for Crisis, Disaster, and Risk Management, School of Engineering and Applied Science, The George Washington University, Washington, DC USA

Correspondence:
Cleto DiGiovanni, Jr., MD
11091 Saffold Way
Reston, VA 20190-3815 USA
E-mail: cdig@july.dgsys.com

Keywords: behavior; bioterrorism; communication; consequence management; mass behavior; psychological; Rift Valley fever; terrorism; weapons of mass destruction

Abbreviations:

RCT = randomized controlled trials
WMD = weapons of mass destruction
US = United States of America

Web publication: 15 March 2004

Abstract

Residents of a community who are intentionally exposed to a hazardous biological, chemical, or radiological agent (including medical first-responders and other civil defense personnel who live in that community) will exhibit a spectrum of psychological reactions that will impact the management of the incident. These reactions will range from a variety of behaviors of normal people under abnormal circumstances that either will help or hinder efforts to contain the threatening agent, deliver medical care, and reduce the morbidity, mortality, and costs associated with the disaster, to the development of new, or exacerbation of preexisting, mental disorders.

Anticipating the decisions that people will make and actions they will take as the crisis develops is hindered by the limited number of previous disasters that bear crucial similarities to a terrorist attack with a weapon of mass destruction. Such actions, therefore, could serve as models to predict community reactions. One result of a study that attempted to fill in these gaps suggested that medical first-responders and their spouses/significant others may require separately crafted information and advice to reduce the potential for disharmony within the family that could affect job performance during the crisis.

For those persons who exhibit emotional lability or cognitive deficits, evaluation of their psychiatric signs and symptoms may be more difficult than imagined, especially with exposure to nerve agents. Appreciation of these difficulties, and possession of the skill to sort through them, will be required of those assigned to triage stations. The allocation and utilization of mental health resources as the incident unfolds will be the responsibility of local consequence managers; these managers should be aware of the results of a recently-held workshop that attempted to reach consensus among experts in disaster mental health, based on the peer-reviewed literature, on the efficacy and safety of various approaches to early psychological interventions for victims of mass trauma and disasters.

Thus, psychological factors are likely to be significant in the management of a terrorist incident that involves an agent of mass destruction. Emergency medical workers with managerial responsibilities, whether limited in scope or community-wide, should be aware of these factors, and should train to handle them through effective risk communication as part of their planning and preparation.

DiGiovanni C: The spectrum of human reactions to terrorist attacks with weapons of mass destruction: Early management considerations *Prehosp Disast Med* 2003;18(3):253-257.

Introduction

When residents of a community realize that terrorists have exposed them to a biological, chemical, or radiolog-

ical agent, they will begin to demonstrate reactions and behaviors that range from normal to pathological,

from understandable to illogical, and from helpful to detrimental. Persons who are responsible for managing the medical, security, resource allocation, or any other aspect of the developing crisis should anticipate and appreciate these varied reactions if they expect to contain the threat and minimize the human and economic costs of the disaster. Complicating these managers' tasks is the possibility that they, their families, and their colleagues will be among those exposed to the threatening agent.

This article will discuss the spectrum of human reactions to a terrorist attack that employs a weapon of mass destruction, with a focus on the early management of these reactions. As used by law enforcement agencies, "weapons of mass destruction" (WMD) is a term that includes any weapon that is capable of producing mass casualties or disruption, and includes conventional, nuclear, and thermonuclear explosive devices, as well as chemical, biological, and radiological agents. In this article, WMD will refer only to the last three of these agents; they are less familiar to the general public through direct or indirect past exposure than are conventional explosives, and biological and radiological agents produce no sensory cues that would allow the victim to discern the presence, extent, and duration of the threat without technical assistance from others.

Initial Reactions and Behaviors

Attempts to understand how people might behave if they were subjected to an intentional release of a biological, chemical, or radiological agent, and how they might respond to direction from crisis and consequence managers, have relied primarily on studies by historians, social scientists, and mental health experts about the behaviors of people caught up in past human-made or naturally occurring events that result in disasters, such as mass shootings, fires, explosions, industrial accidents, and weather-related phenomena. With few notable exceptions, such as fires in buildings with blocked or inadequate exit routes, people in disasters have tended to behave without panic and with a sense of compliance, orderliness, and even altruism.^{1,2} These qualities were reported widely in the press among those attempting to escape, and attempting to help others escape, from the Pentagon and the World Trade Center's twin towers on 11 September 2001, and among those who responded everywhere to the events of that day.

Responsible behaviors during natural disasters caused by naturally occurring events also have been observed among first-responders and other emergency personnel, despite the potential for conflict in their loyalties to their jobs and to their families. Although Killian, in a seminal paper published 50 years ago, raised the possibility that emergency personnel might abandon their jobs and tend, instead, to the needs of their families during a community disaster,³ Quarantelli investigated the responses of >6,000 emergency workers in 150 tornadoes, floods, hurricanes, and earthquakes between 1964 and 1974, and found no evidence that these workers abandoned their official responsibilities.⁴

Impressions of human behaviors become less reassuring when formed from examinations of disasters that have involved chemical, radiological, and biological agents. This examination, however, is hampered by the relative paucity

of incidents that share critical similarities with potential WMD events.

Historical and medical literature contain reports of variously sized groups reacting to the feared presence of "mysterious gases" in their surroundings by believing somehow they were affected and seeking medical care, often in such numbers as to overwhelm local healthcare facilities. This phenomenon has occurred among impressionable schoolchildren, combatants in war, male military recruits, populations richly experienced in terrorism, and ordinary residents of ordinary communities.⁵ (There is no reason to believe that such behaviors will not accompany the release, or rumored release, of a chemical or other WMD agent in the United States of America (US) if people believe they are at risk of exposure to it. Labeling those who are symptomatic, but not contaminated as "the worried well" risks trivializing their distress and their capacity to soak up available medical resources.)

Psychological distress was the only health consequence of the 1979 nuclear power plant accident at Three Mile Island, Pennsylvania, and it became an epidemic among workers involved in the 1986 nuclear power plant incident at Chernobyl.⁶ The popular fear of radiation is illustrated by a 1987 incident in the city of Goiania (population of one million), the capital of Goias state, Brazil. There, accidental release of cesium-137 from a medical device in an abandoned clinic produced four deaths from acute radiation sickness, and 249 people with internal or external contamination.⁷ However, approximately 125,000 people, or 10% of the city's population, sought screening for radiological contamination. Of the first 60,000 screened, 5,000 complained of actual symptoms of radiation sickness—rashes, vomiting, and diarrhea—but none was contaminated.⁶

These reactions are unlike those mentioned earlier in this section. On the other hand, when a PhD candidate in the Department of Sociology at Colorado State University telephoned about a dozen organizations within a five-mile radius of Three Mile Island after the accident there, he found "not one case of role abandonment" among teachers, bus drivers, the police, civil defense workers, state troopers, the National Guard, or employees of the Pennsylvania Emergency Management Agency⁸—a loyalty to duty similar to that of emergency personnel in conventional incidents.

Among biological events that have occurred over the past several decades, one that has many ingredients of a WMD attack was the Spanish flu pandemic of 1918. The second, and deadlier, wave of this illness appeared in the US in Boston on 28 August 1918 with eight reported cases.⁹ Rapid escalation in numbers of cases, mortality rates, and geographic distribution followed.⁹ By the time the outbreak subsided around the end of the World War, 28% of the US population had become ill, and a half-million persons had died.⁹ Those deaths dropped the average life expectancy in the US from 51 years in 1917 to 39 years in 1918.⁹

The outbreak in Boston was accompanied by war-inspired rumors that a German pharmaceutical company had blended influenza germs into its aspirins; that a German ship had released a cloud of germs over the city, and that saboteurs had come ashore from a German submarine and

disseminated germs into crowds in Boston. The head of the Health Sanitation Section of the Emergency Fleet Corporation confirmed the story of the saboteurs, which appeared on Page 1 of the Philadelphia Inquirer on 21 September 1918.⁹

Americans reportedly responded to the flu pandemic with "resourcefulness, civility, and mutual aid," and generally were willing to care for their loved ones at home as hospitals became overcrowded.² This response might bode well for public reaction to a future bioterrorist attack in the United States. However, it should be noted that the spread of flu was so pervasive and rapid that there were no safe havens in the US to which any resident could escape. There also were no medications or vaccines to demand or for which to compete, and options for survival were limited; hospital personnel hung blankets or sheets between the beds of patients to try to inhibit the spread of the virus, and people were encouraged, sometimes ordered, to wear masks to cover their noses and mouths. These extremely dire circumstances may not exist in a bioterrorist attack today, where those affected might retain hope of escape or treatment or cure, whatever the competition, costs, or risks for their safety and that of the public health, in general. Furthermore, for all its devastation, the Spanish flu pandemic of 1918 was not widely reported except for its statistics, so how extensive our knowledge is about the behaviors and reactions of the public as the disease raged really is unclear. Alfred W. Crosby, a historian of the pandemic, noted that in the Readers' Guide to Periodical Literature from 1919 to 1921, baseball citations measured 13 inches; Bolshevism, 20 inches; Prohibition, 47 inches, and the flu, 8 inches.⁹

Prior to the October 2001 cases of cutaneous and inhalational anthrax along the East Coast, there had been one instance since 1900 of terrorist use of a biological agent in the US. In September 1984, the leaders of the Rajneeshees, a religious cult with a large commune in a rural area east of Portland, Oregon, contaminated local restaurant salad bars with *Salmonella typhimurium* and produced 751 cases of food poisoning in an attempt to sabotage local elections in the face of increasing community hostility to their presence. No one died, but 45 people required hospitalization.¹⁰ A year passed before this incident was recognized as a deliberate criminal act, and the psychological fallout from it, if any, is unknown.

The late 2001 anthrax cases created concern among employees and other persons at targeted facilities, but there was no evidence of hysteria or panic among these groups or the broader population. Early miscommunication and conflicting advice from health experts may have contributed to the confusion about optimal treatment and the pros and cons of vaccine among many of those affected or threatened, but, on balance, they and everyone else took this brief episode well. The perpetrator(s) of this incident, however, did not produce the critical mass of localized casualties that would be needed to frighten the public at large. Similarly, the introduction of West Nile fever into New York in 1999 and its migration through the United States since then, have failed to produce the concentration of patients that would likely be seen in a bioterrorist incident and that could challenge people's emotions and influence their behaviors.

The emergence of HIV in large cities on both US coasts in the early 1980s resulted in a banding-together of those affected, along with numerous examples of caring, mutual support, and altruism among them. They were joined by small numbers of physicians and scientists who were touched by their plight or intrigued by the science of this new disease. These actions, however, stood in contrast to the reactions of the public at large (including the broader medical and dental communities), which was to marginalize still further an already marginalized segment of our society. To a lesser degree, shunning of victims also occurred in the 1976 outbreak of what became known as Legionnaire's Disease, when elderly men who attended an American Legion conference at a Philadelphia hotel became ill with an initially unknown, but then often fatal disease.

Other major disease outbreaks that have occurred in the recent past also are of limited value as predictors of behaviors in future bioterrorist incidents. During the past decade, foot-and-mouth disease in Europe and elsewhere, and the emergence of "Mad Cow Disease" in the United Kingdom, have had a major economic impact, but have not produced significant numbers of infected humans. (At first, Mad Cow Disease's rate of infection was unknown. The scientific understanding of the situation was poor, and the government had trouble establishing its credibility as it tried to address the public's concerns.) There were cases of Marburg virus infection in Germany and Yugoslavia in 1967, but only among research laboratory workers. In 1972, a single case of smallpox in Yugoslavia resulted in the eventual quarantine of 10,000 people for periods up to two weeks, the immunization of 20 million people, and the closing of borders between that country and its neighbors in an episode that lasted nine weeks,¹⁰ but there was no reported sense of a life-threatening "epidemic."

Thus, although retrospective studies of human behaviors in past disasters are the basis of our current emergency planning for future WMD attacks, they present a limited and mixed understanding of the kinds of reactions that community residents might exhibit in response to a terrorist release of a WMD agent. In an attempt to craft a prospective study of these possible reactions, investigators created an 83-minute video from a scenario that involved the aerosolized release of Rift Valley fever virus into a southern US semi-rural area, and recruited 153 residents of that area to watch the video and relate their reactions and likely decisions as the event unfolded. Their answers to questions asked of them were provided in a way that preserved their anonymity and confidentiality.

One finding from this study was that medical first-responders (emergency medical technicians and hospital emergency department staff) differed from their spouses/significant others in perception of the danger posed by a terrorist attack versus a naturally-occurring outbreak, willingness to report for duty in the midst of a community-wide bioterrorist threat, and a demand for protective vaccine as a *quid pro quo* for reporting for duty; spouses/significant others were more frightened than were their mates, and were more protective of their mates than were the first-responders willing to be protective of themselves.¹¹ This finding raises the possibility that risk communications to

the first-responder family may need to take into account the different fears and needs for information that exist within that family, and that reliance on the first-responder to allay the fears of his/her family may not be sufficient to prevent anxiety within the family that could affect work performance and manpower staffing during a crisis. Another finding from this study was that even residents of the community with medical training and experience, i.e., the medical first-responders, easily became confused when presented with too much information from a variety of sources about a novel threat.

Assessing the reliability of information, and communicating risk to subordinates (and their families), will be critical responsibilities at every management level in a crisis. Whether one's managerial responsibilities are to a small team or to an entire community, the opportunities to be constructive and credible are fleeting in a mysterious, fast-moving, and potentially devastating crisis (such as might be the case with a WMD agent). Whoever takes on these responsibilities would be well-advised to think about the tactics and strategies of risk communication, and to practice them in training scenarios, before the need to employ them in a real-world situation arises. Unfortunately, however, part of that preparation involves anticipating what behaviors might be exhibited by those whom one must manage, and on that point, data, as seen from the above discussion, are limited.

Clinical Issues

The emotional valence associated with a terrorist attack is apt to be different than that of a naturally-occurring or accidental event, and can contribute to greater psychiatric morbidity.^{12,13} The first step in managing these patients is accurate triage.

The perception that the "worried well" are identified easily is dangerous, especially if the threat is from a nerve agent (e.g., sarin, tabun, soman, or VX) where accurate and rapid diagnosis and triage will influence the initiation, or non-initiation, of treatment with atropine. Withholding atropine from a victim of nerve agent exposure, or giving it in the doses required to a person mistakenly diagnosed as a victim of exposure, could have equally untoward effects. Studies done in the 1950s and 1960s with human volunteers who were exposed to nerve agents or chemically similar agents (some volunteers were not told what to expect) revealed that psychological disturbances could be more prominent than physical signs and symptoms, even when acetylcholinesterase levels were reduced by 60–90%; these disturbances included intellectual impairment, anxiety, and psychomotor retardation.^{5,14} Other psychiatric disturbances associated with acute exposure to nerve agents or organophosphate pesticides include emotional lability, depressed mood, and a range of cognitive deficits.^{5,15–21} Thus, persons assigned to triage victims of a possible chemical attack must be aware of these mental and emotional status changes, and skilled in their assessment.

Another issue in the early management of a disaster involves the utilization and allocation of mental health resources. There is no doubt that an unfolding disaster is emotionally traumatic for everyone involved. For some,

that event may set the stage for later psychiatric illness. For these reasons, mental health providers often will offer their services, and consequence managers must determine the value of these services, when they are needed, and who is qualified to provide them. To bring some structured approach to answering these questions, an international group of experts in disaster mental health held a workshop from 29 October to 01 November 2001 near Washington, DC. That workshop, funded by grants from the US Departments of Defense, Justice, Health and Human Services, and Veterans Affairs, and the American Red Cross, examined the peer-reviewed literature in an effort to reach consensus on the best practices for early psychological intervention for victims of traumatic events; ("early" was defined as within the first four weeks of the event).²²

Following are some issues of importance to medical and consequence managers as a disaster unfolds, on which workshop participants reached consensus (although not necessarily unanimity). First, it is inappropriate to assume that people who appear distressed in the early post-incident phase have clinically significant mental disorders, except for those with a pre-existing psychiatric condition. During this immediate phase, it is sensible to adopt the principle that distressed people will recover and have normal outcomes. Second, when early psychological intervention sessions are offered, whether for groups or individuals, participation in them should be voluntary, not mandatory or expected. Third, data from randomized, controlled trials (RCT), although limited in quantity, suggest that early, brief, and focused psychotherapeutic intervention can reduce distress in spouses, parents, and children who have sustained losses. Workshop participants also noted that two small RCT suggest that "cognitive behavioral" therapy (that teaches patients to recognize the differences between how they frame a problem and the reality of that problem) may help reduce the incidence, duration, and severity of acute stress disorder, post-traumatic stress disorder, and depression in survivors.

Fourth, data from RCT also suggest that early interventions that consist of single, one-on-one recitals of traumatic events and emotions associated with those events do not consistently reduce the risks of later development of post-traumatic stress disorder or other adjustment difficulties. Some survivors may be at heightened risk for adverse outcomes as a result of participation in this form of early intervention. Fifth, there are forms of early psychological intervention that are publicized by their practitioners, despite the lack of data regarding either their efficacy or safety.

The workshop participants also observed that certain interventions, such as mass education through the media, psychological triage, and leadership consultations, have a high potential for unintended harm, and that disaster managers should try to ensure that persons who perform such functions during a crisis have the knowledge and accountability to do so.

The participants defined key components of early psychological intervention, such as "psychological first aid" (e.g., reduction of physiological arousal, mobilization of support for those who are most distressed), and psychological triage

(e.g., identification of patients who are vulnerable and at high risk for the development of psychiatric complications). They also developed guidance for the timing of early psychological interventions. During the first 48 hours of the incident, the goals should be survival and protection from further harm, and facilitation of communication with family, friends, and the community. The goal during the first week should be adjustment, with mental health professionals assisting with needs assessments, triage, and outreach and information dissemination.

No one questions the potential for significant psychological morbidity associated with a mass disaster, but there is a need for more and better data to establish the efficacy and safety of early psychological interventions as ways of reducing that potential. Consequence managers with resource allocation responsibilities during the acute phases of a disaster should keep this point in mind.

Conclusions

Most disasters familiar to healthcare professionals have an obvious beginning and end, and well-delineated zones of safety and danger. Most medical first-responders report for

duty and carry out their responsibilities comforted by the knowledge that their own families are safe if they are not in these areas when the danger is present. Such knowledge and reassurances may be unavailable with a terrorist-authored attack with a WMD agent. The circumstances that shape the behaviors of normal people under abnormal conditions, and that spawn psychopathology in a few of them, will exist throughout the affected community and may blur the distinction between victim and rescuer. Anticipating and preparing for the range of psychological factors associated with a WMD incident should be a component of disaster training and planning for all emergency healthcare providers, especially those with managerial responsibilities.

Acknowledgements

The author thanks Mr. Josh Vayer, Director of the Casualty Care Research Center of the Uniformed Services University of the Health Sciences, Bethesda, MD USA, and Dr. Simon Wessely, Professor of Psychiatry at King's College and the Institute of Psychiatry, London UK, for their comments and suggestions.

References

- Bryan JL: Human Behavior and Fire. In: Cote AE (ed), *Fire Protection Handbook*. Quincy, MA: National Fire Protection Association, 1986. pp 1-17.
- Glass TA, Schoch-Spana M: Bioterrorism and the people: How to vaccinate a city against panic. *Clin Infect Dis* 2002;34:217-223.
- Killian LM: The significance of multiple-group membership in disaster. *American Journal of Sociology* 1952;57:309-314.
- Quarantelli EL: Structural Factors in the Minimization of Role Conflict: A Reexamination of the Significance of Multiple Group Membership in Disasters. Preliminary Paper 49. Columbus, OH: The Disaster Research Center at The Ohio State University, (undated).
- DiGiovanni C: Domestic terrorism with chemical or biological agents: Psychiatric aspects. *Am J Psychiatry* 1999;156:1500-1505.
- Armed Forces Radiobiology Research Institute: White Paper: *The medical and psychological consequences of radiation dispersal devices*. Bethesda, MD: Armed Forces Radiobiology Research Institute, 2000.
- Dodd B: The radiological accident in Goiania. Presented at the NATO-Russia Advanced Research Workshop in Social and Psychological Consequences of Chemical, Biological, and Radiological Terrorism, held at NATO Headquarters, Brussels, Belgium, 25-27 March 2002.
- Mileti DS: Testimony before the Atomic Safety and Licensing Board, US Nuclear Regulatory Commission, in the matter of Long Island Lighting Company, Shoreham Nuclear Power Station Unit 1, Docket No. 50-322-OL-3, Emergency Planning Proceeding, 18 November 1983.
- Kolata G: *The Story of the Great Influenza Pandemic of 1918 and the Search for the Virus that Caused It*. New York: Simon and Schuster, 1999. pp 3-4, 7-8, 12-13, 18-20, 52.
- Carus WS: Working Paper: *Bioterrorism and biocrimes: The illicit use of biological agents since 1900*. Washington, DC: National Defense University Center for Counterproliferation Research, 2001.
- DiGiovanni C, Reynolds B, Harwell R, et al: Community reaction to bioterrorism: Prospective study of simulated outbreak. *Emerg Infect Dis* 2003; 9:708-712. Available at <http://www.cdc.gov/ncidod/eid/vol9no6/02-0769.htm>.
- Norris F, Friedman M, Watson P, et al: 60,000 disaster victims speak, Part 1: An empirical review of the empirical literature, 1981-2001. *Psychiatry* 2002;65:207-239.
- Norris F, Friedman M, Watson P, et al: 60,000 disaster victims speak, Part 2: Summary and implications of the disaster mental health research. *Psychiatry* 2002;65:240-260.
- Bowers MB, Goodman E, Sim VM: Some behavioral changes in man following anticholinesterase administration. *J Nerv Ment Dis* 1964;138: 383-389.
- Sidel FR: Soman and sarin: Clinical manifestations and treatment of accidental poisoning by organophosphates. *Clin Toxicol* 1974;7:1-17.
- Eyer P: Neuropsychopathological changes by organophosphorus compounds—A review. *Hum Exp Toxicol* 1995;14:857-864.
- Nozaki H, Aikawa N, Fujishima S, et al: A case of VX poisoning and the difference from sarin. *Lancet* 1995;346:698-699. Letter.
- Minton NA, Murray VS: A review of organophosphate poisoning. *Med Toxicol Adverse Drug Exp* 1988;3:350-375.
- Levin HS, Rodnitzky RL: Behavioral effects of organophosphate in man. *Clin Toxicol* 1976;9:391-403.
- Feldman RG, Ricks NL, Baker DL: Neuropsychological effects of industrial toxins: A review. *Am J Ind Med* 1980;1:211-227.
- 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.
- National Institute of Mental Health: Mental Health and Mass Violence: Evidence-Based Early Psychological Intervention for Victims/Survivors of Mass Violence. A Workshop to Reach Consensus on Best Practices. NIH Publication No. 02-5138 Washington, DC: U.S. Government Printing Office, 2002. Available at <http://www.nimh.nih.gov/research/massviolence.pdf>.