**Chapter 38
Weapons of mass destruction**

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**Introduction**

The phrase “weapons of mass destruction” was originally a military/political term for chemical, biological, or nuclear weapons intended for use in society-wide terrorization or destruction; the original term may have been used for chemical weapons delivered by aircraft. A weapon of mass destruction (WMD) itself can harm or kill large numbers of people, and potentially damage the environment or make it hazardous for humans or animals. While the definition is somewhat flexible, in general the assumption is that referring to something as a “WMD event” means that it was a deliberate and planned use of a powerful and dangerous material or device intended to cause large numbers of casualties and significant damage [1,2].

Weapons of mass destruction were originally developed by governments and nations, in large part due to the expense and technical expertise required to research, create, and employ them. In recent decades, though, so-called “non-state actors” have acquired, created, and employed WMDs in attacks on both humans and nature. The term *non-state actor* is generally understood to mean a political, social, religious, or other group not declared to be acting on behalf of a national government but to further a particular cause. The methods used by such groups may range from peaceful discussion and publicity, to non-violent civil disobedience, to targeted violence, to indiscriminate terrorist attacks. Since such groups are often not publicly organized or accessible, it is difficult to affect or dissuade them from courses of action in the ways that nation-states may be influenced, such as trade actions, diplomacy, blockade or other acts of war. This, along with some organizations’ secrecy, may contribute to the apparent unpredictability of their actions. In effect, what they do may not fit with the rational worldview of many disaster planners [1,2].

One of the early uses of WMDs by such a group was the Aum Shinrikyo attacks with sarin nerve agent in Matsumoto, Japan, in 1994, and on the Tokyo mass transit system in 1995. These two events resulted in thousands of casualties, including 11 deaths. Especially concerning, EMS responders were among the injured, potentially compromising the response. In large part, the rescuer casualties were due to lack of training or understanding of the scene threats posed by a WMD attack [3,4].

In the years since then, several major attacks have been popularly accepted as WMD terrorist events. The anthrax letters mailed in the United States in 2001–2002 fit the classic definition of a WMD event in that they involved a biological weapon which caused some casualties and deaths and also compromised the environment and functioning of the US postal service. Other events such as the 9/11 New York attacks loom in the public mind as WMD terror, even though the weapons themselves were essentially explosives and incendiaries. Mass shooting events, such as the Columbine, Colorado, and Newtown, Connecticut, school shootings, and the 2011 Norway mass shooting tragedy, also share some of these characteristics.

From the planning and response view, it is fair to approach all such major terror attacks as “WMD events,” in that they share certain characteristics which directly affect the EMS planning and response to them. While the remainder of this chapter will briefly address specific agents and the response to them, the approach will be more of a description of a general planning and response mindset. Other chapters in this book, and numerous other references, provide detailed information on treatment of specific entities such as chemical weapons (improvised hazardous materials, nerve agents, blister agents, choking agents, blood agents), biological weapons (anthrax, smallpox, tularemia, hemorrhagic fevers, toxins), radiological agents (powder, gas, or other forms of radioactive contamination), blast agents (explosives, whether commercial, military, or improvised), nuclear weapons (combining blast and radiological issues), and intentional trauma (typically by gunfire in these cases).

**Unique aspects of WMD**

There are several characteristics peculiar to WMD attacks (whether terroristic or military) that must be considered in preparing for an EMS response. Three particularly salient ones are intent, magnitude, and forensics. Training, planning, and drilling for a WMD response must incorporate means of facing all of these issues.

*Intent* is used to mean that the perpetrators of a WMD attack want to cause casualties. This is not an accidental event or a complication of another emergency (such as a hazmat spill occurring due to a vehicle crash). The planners and executors of a WMD attack at minimum want to inflict some casualties, usually to draw attention to their cause. Often they may intend to inflict very large numbers of casualties, or do so in a particularly noteworthy way. EMS providers and hospitals are seen by society as help and succor; as a result, targeting them may be a very effective way of demoralizing a society. In addition, if the attackers wish to aggravate the effect of their attack, eliminating or crippling the medical response can multiply the number of casualties significantly. This puts EMS providers at high risk of attack in a WMD event, whether as part of the initial event or as targets of a “secondary device.” Picture, for example, the effect at the Boston Marathon of a delayed bomb going off as rescuers moved in to render aid [5]. EMS physicians and providers must be trained and equipped to detect and survive initial attacks and avoid secondary attacks even as they do their jobs [4,6–8].

As alluded to earlier, the sheer *magnitude* of a WMD event may be overwhelming. Casualty figures can easily rise into the hundreds [5] or thousands [9–11], and there may be a significant penumbra of psychological casualties in addition to those physically injured by the event. The medical care systems may be quickly overloaded, and EMS providers may need to serve as the primary care personnel for long periods of time. In addition, hospital use and destination may be changed, especially in a longer-term biological event, and supplies may be strained due to the number of casualties, the duration of the event, or the unusual antidotes needed.

To face these issues, an EMS system must have robust communications between its units, dispatchers, and destinations (typically hospitals). In addition, it is critical that EMS systems be aware of local, regional, state, and national plans for response that may affect their actions. If, for example, a locality has decided that all patients from a smallpox outbreak must be treated at Hospital A, EMS must know how to determine which patients are to be transported there. There may also be significant secondary loads on an EMS system due to the need to move hospital inpatients to other levels of care, such as skilled nursing facilities. In some biological WMD events, EMS may have an expanded role, such as providing community-level health screening, treatment, or vaccination. In preparation for all these eventualities, an EMS system’s medical director and administrators must be part of local and regional planning, and either pretrain their personnel or be ready to implement just-in-time training when an event occurs. Communication networks must be established, tested, and robust, to allow for a complex and potentially lengthy response to be controlled.

The *forensic* aspect of WMD events is less salient in the immediate response but since by definition this type of event is deliberate, there will be a criminal investigation. It is imperative that EMS providers (and other rescuers) take all care possible to not compromise such an investigation by inadvertent damage to evidence. In a WMD event, bodies themselves may be relevant evidence, and victims may include the perpetrators themselves. Investigative teams may be operating in unsecured scenes, and may need specific medical expertise or support to do their jobs. While the primary focus of an EMS system response to a WMD event is still patient care, it is useful to have preevent discussions and training with law enforcement on scene security, tactical EMS response, and interagency cooperation [12,13].

**Special requirements for WMD response**

Emergency medical services preparation for WMD response begins with the general training needed to respond to any mass casualty event, including principles of communication, triage, scene control, and destination choice. In addition, all EMS physicians and providers should be familiar with basic aspects of response to hazardous materials, and with basic principles of health maintenance and infection control (self-care, vaccination, universal or air-borne precautions). These skills form the bedrock for training to respond to a WMD attack. The next layer of training most likely should encompass how to operate in a complicated interagency environment, since that is what will be faced in a WMD response [14]. Training should be required in local, regional, and state mass disaster response plans. Individuals’ roles must be specified, even if the role is as simple as “You must come to work and will be assigned to an ambulance.” Higher level administrators and system medical personnel (supervisors, medical directors, field physicians) may need further specialized training to be ready to serve as a resource in a WMD environment (e.g. how to dose specific antidotes or safely perform field amputations).

Logistics and supply are critical to an effective and sustained response. In many cases a WMD event may require large quantities of otherwise rarely used materials, such as hundreds of tourniquets, thousands of doses of antidotes, or tens of thousands of doses of antibiotics. Part of an EMS system’s preparation for a WMD event is to ensure access to supplies. Some resources may include local distributors, stockpiles at hospitals, or state or federal agency resources (such as the National Pharmaceutical Stockpile managed by the US Department of Health and Human Services). Much of the planning for this aspect of an event is similar to planning for natural or accidental mass casualty events, but the medical director must be aware of specialized resources such as large quantities of atropine for nerve agents, radiological antidotes, or mass trauma supplies. In some jurisdictions there may be issues with physician authority for controlled substance dispensing, storage, and use; it is imperative to sort out such issues ahead of time so that medications such as opiates and benzodiazepines are available to EMS units if needed. In addition to patient care supplies, EMS crews must be able to obtain personal protective equipment in adequate quantities to protect themselves when operating in a WMD environment [15,16]. This aspect of planning requires that an agency know how its personnel are supposed to be deployed in such an event, and therefore must be discussed prior to an attack.

Other logistics that must be planned for include staff needs, such as food, replacement clothing, and communications with family. In some circumstances an agency may need to provide for the physical needs of family members to allow the staff to function at full effectiveness.

Coordination of response to a WMD event does not stop with the paper plan, of course. Full field drills, tabletop exercises, and skills maintenance are critical in maintaining an EMS system’s readiness to respond to a WMD event. Personnel must, for example, know how to use autoinjectors if that is part of a response plan, but also know where they are stored and who to ask to get them. Since time may be critical in an actual response, “muscle memory” is vital to quick and effective action. This means that training and drills should be as realistic as possible, so as to inculcate the proper “automatic” responses in personnel. Local, regional, and state government agencies hold periodic exercises, and the federal government does so as well. It behooves an EMS medical director to be aware of such exercises in his or her area, and get local agencies involved.

Due especially to the number of casualties that may result from a WMD attack (or a pandemic such as influenza), there has been national planning for using so-called “altered standards of care” in such situations [17]. In addition, there is the possibility that jurisdictions or regional health systems may need to specifically direct patients to particular facilities in some WMD events, such as bringing victims to sites that have extensive decontamination capability or stockpiles of antidotes. While altered standards of care and alternative destinations may not be relevant for all WMD responses, agencies must be part of the planning so they can do what is expected in the response [9,17].

**Conclusion**

Safe and effective response to a WMD event is the ultimate test of an EMS system. Personnel must be properly trained, directed, equipped, and led to save the most lives possible in a complex environment where they themselves may be targets, may be the only medical care available, or may notice peculiarities that lead to identification of perpetrators. Preparing for a WMD response requires more than just knowing how to treat specific clinical entities. It requires cooperation, communication, and coordination with all aspects of the emergency and governmental response to the attack. Medical directors and EMS physicians must play an active part in preparing for such a scenario.

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