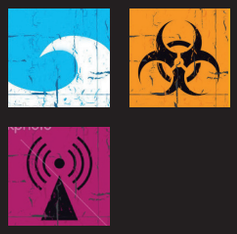

Chapter 9

Scene Safety and Security

By David G.C. McCann, BSc, MD, MPH, CCFP, FAASFP

Preface

Disasters pose numerous challenges to first responders, especially in terms of personal safety. Even in nondisaster situations, there is some evidence that prehospital workers are at an increased occupational risk. A study by Maguire and coworkers[1] found an annual rate of 12.7 fatalities per 100,000 EMS workers when compared with a national average of 5.0 per 100,000 workers. This lends credence to what prehospital responders have long known intuitively—responding to emergencies in the prehospital environment is inherently dangerous.[2]

This is all the more true in disasters. Unexpected hazards wait at every turn and well-meaning but ill-advised heroics place first responders at an increased risk. First responders and hospital-based personnel must be trained to put their own safety and that of their team ahead of all other concerns. This is counterintuitive for most healthcare workers, especially EMS workers "who feel that being a rescuer means going into a situation when others are going in the opposite direction."[3] Changing this hero mindset is essential within the disaster zone. When a rescuer is injured through lack of safety awareness, assets needed by other disaster victims are diverted and the situation within the disaster zone is further compromised. It would have been better if he/she had not come to work that day.

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Safety Issues in Disaster Response

In 2004, the Rand Corporation initiated a comprehensive study of first responder safety issues in disaster and terrorism response[2] under the auspices of the Centers for Disease Control and Prevention (CDC). The resulting report noted several characteristics of disasters that place first responders at an increased risk:

- Large number of affected people injured or killed. For example, almost 300,000 people were lost after the Tsunami in Southeast Asia in 2004.[4]
- Large geographic scale. Hurricane Katrina affected nearly 90,000 square miles of the US Gulf Coast.[5]
- Long duration of response. World Trade Center disaster operations continued for 8 months after the terrorist attacks on September 11, 2001.[6]
- Multiple hazards of various types depending on the type of disaster, for example, after hurricanes, downed power lines pose a serious threat, whereas structural collapse is a significant concern after major earthquakes.
- Potential for chemical, biological, and radiation hazards associated with terrorist incidents.[7]
- Deployment of a wide range of capabilities (e.g., cranes, reinforced concrete cutting machinery, etc.) that responders are not used to working with and that increases the risk to them.
- Large disasters require multiagency response where poor communication among different agencies can increase the risk to response personnel.[8]
- Convergence of large numbers of self-deploying volunteers who take resources and supplies from regular response personnel; such volunteers are usually not trained or equipped for disaster operations.
- Damage to infrastructure—landmarks obliterated, road signs destroyed, and roads blocked making access to the disaster site risky.

In addition, psychological trauma associated with disaster response leaves responders at a significantly increased risk for post-traumatic stress disorder (PTSD).[9]

Because disasters place responders at increased risk, it is critically important that scene (or zone) safety issues are taken seriously. The majority of disaster responses in North America use the Incident Management System (IMS), where safety issues are a top priority for both Command Staff and responding personnel. Within the IMS structure, the role of the Incident Safety Officer (ISO) serves as the lead for anticipating and managing safety concerns. In fact, the ISO is the only person in the IMS who can overrule the Incident Commander in matters concerning safety.[10] It is very important that the IMS be established as quickly as possible in any disaster situation. There is an old adage in the IMS—for every 5 minutes you hesitate to set up the IMS, it will take an extra 30–60 minutes to get control of the scene.[7] For more information on the IMS, please refer to Chapter 5.

Scene safety is best approached using the *safety management cycle,* which involves 3 functions that should occur continuously throughout any incident[2]:

1. Gather information (about safety issues, hazards, etc.)
2. Analyze the options and make a decision (to minimize/mitigate safety issues)
3. Take action

Ideally, the ISO should be properly trained to use the safety management cycle as a framework to guide scene safety. Furthermore, the ISO should follow an "all-hazards" mindset; that is, he/she should always be mindful of the disaster environment and be scanning for any and all types of hazards, expected or not.

Major safety issues that should be addressed at any disaster scene include the following:

- Personal protective equipment (PPE)—what level is needed? Where will the PPE be obtained and for how many?
- What specific hazards are likely in this disaster?
- Where is the disaster scene? By what route(s) will it be accessible?
- To whom will responders report? (This is an issue if the IMS has not yet been activated. Once it is activated, the Incident Commander or the appropriate Section Chief would be the person).

PPE

There are 4 levels of PPE, and responding personnel should be properly trained in donning and doffing PPE *prior to an actual incident.*[7] The level of PPE required will be determined by the hazards at the disaster site.

Level "A" PPE

This is the highest level of PPE protection. It requires a vapor-resistant suit with a self-contained breathing apparatus (SCBA). Level "A" PPE is appropriate when protection is needed for skin, mucous membranes, and lungs. It protects against petroleum products, nerve agents (e.g., VX, sarin), and blister agents (e.g., nitrogen mustard). HAZMAT teams entering a "hot zone" with unknown potential chemical hazards must wear Level "A" PPE until the type and concentration of the hazards are known to be compatible with a lower level of PPE.

Unfortunately, Level "A" PPE is notoriously difficult to work in. The large gloves are thick and severely limit the manual dexterity and tactile sensation. Responders cannot wear Level "A" PPE for more than 20 minutes because of heat, increased sweating, and dehydration with electrolyte imbalance. Donning and doffing the equipment require extensive training to avoid contamination.

Level "B" PPE

One step down from Level A, Level "B" is used when the highest level of respiratory protection is required but less skin protection is needed. There is no true vapor barrier in Level "B"—it requires a hooded, chemical-resistant suit and full face mask with SCBA.

Level "C" PPE

Level "C" PPE uses a powered air-purifying respirator (PAPR) with a hooded, chemical-resistant suit and full face mask. PAPRs are appropriate when the concentration and type of airborne substances are known with certainty and safe for use with a PAPR.

Level "D" PPE

This level involves wearing ordinary street clothes accompanied by a waterproof apron, boots, a face shield, safety goggles, and gloves—the equivalent of "universal precautions."

Level "A" and "B" PPE require physically fit, extensively trained personnel who are properly fitted and regularly retrained in the appropriate use of the outfits. Level "C" PPE is easier to work in for long periods but still requires proper fit testing and use of the appropriate PAPR filter for the particular inhalational hazard.

Further information on PPE, decontamination, and hot/cold zones can be found in Chapter 16, "Disasters with Contaminations."

Disaster Specific Hazards

It is worth repeating that an all-hazards approach is critical to an appropriate disaster response. With this mindset, one does not require a different plan for each type of disaster. Rather, a common approach to all disasters is used which recognizes those commonalities inherent in disaster scenes.

This "all-hazards" approach is used as the basis of plans that are adapted to specific disasters. There are hazards that are common to many scenarios and should be looked for aggressively while always keeping in mind that other, less common hazards may also be present. Some examples follow:

- Hurricanes—look for downed power lines, trip hazards, flooding that can easily wash away persons and vehicles, contaminated water supplies (sewage), displaced venomous animals (e.g., rattlesnakes), downed trees blocking roads, structural instability of storm surge-ravaged buildings, falling debris, increased vectors of disease (e.g., mosquitoes with West Nile Virus), possible HAZMAT situations (e.g., during Hurricane Katrina, Murphy Oil based in New Orleans leaked 220,000 gallons of crude oil from a holding tank ruptured by the storm surge), potential for drowning, and need for personal flotation devices (particularly during search and rescue operations).
- Earthquakes—ruptured gas lines, downed power lines, tri hazards, structural instability and collapse, falling debris, inaccessible roadways, sinkholes, fires, and possible HAZMAT situations (e.g., chemical factories in earthquake zone).
- Terrorism—chemical, biological, radiological, nuclear, and explosive hazards (CBRNE), fires, secondary off-gassing of nerve agent prior to decontamination, radiation exposure, and so on. It is important to realize that any terrorist incident may involve secondary devices timed to go off after first responders have arrived. A perfect example of this occurred on September 11, 2001 when the second plane hit the World Trade Center 15 minutes after the first plane and injured or killed first responders who were already on scene.

Clearly, it is incumbent on the ISO to have "situational awareness" and to manage both the expected and unexpected hazards. No matter what the type of disaster, the ISO must constantly be mindful of such dangers as excessive fatigue, dehydration, and exposure for his/her response personnel. Examples include summer heat, with the risk of heat stroke, whereas in the winter, hypothermia is a major threat. When responders are overtired, they become careless and are more likely to be injured. Therefore, the ISO must insist that a 12-hour shift is never breached for first responders.[2] It is essential that Command Staff lead by example in this area—if the Incident Commander does not take necessary sleep breaks, those reporting to him likely will not either.

What Route(s) to the Disaster?

This can be a real issue especially when landmarks and road signs have been destroyed. GPS devices are a big help and should be readily available. However, downed trees and other road hazards may render usual routes inaccessible.[2] It is therefore important to have first responders familiar with the local environment. Self-deploying so-called "convergent volunteers" can easily become lost when they are in unfamiliar topography. It may be advisable to have a police escort if road conditions are hazardous. First responders should don appropriate PPE before arriving at the disaster scene, since many first responders will forget to don PPE on arrival.

On Arrival at the Scene

The seasoned disaster worker knows that scene assessment before exiting the vehicle is a must. If unknown hazards (e.g., HAZMAT) exist, park "uphill and upwind" of the disaster scene. Do not park near any damaged trees or structures that could collapse and render the vehicle unusable. Do not park anywhere near downed power lines or flooded areas. Remember, it takes only 2 ft of water moving at 6 miles per hour to carry a vehicle away in a flood situation. If an Incident Command site has been set up, park near the command post and report to the Incident Commander or the appropriate Section Chief.

Scene Security

An important aspect of scene safety is the concept of scene security. Most hospitals assume that the local police will be on-site to maintain security in a mass casualty incident. However, in a large scale disaster, police, fire, and EMS will be stretched to the limit. Hospitals cannot count on the police for their security under such circumstances. Therefore, security personnel and planning should be factored into the hospital's emergency planning. Furthermore, in a disaster, hospitals are frequently overwhelmed and need to secure all doors but one to ensure controlled access by the public.[11] This is even more important during a contaminated event where uncontrolled traffic can compromise the hot/cold zone systems.

In the prehospital disaster site, it is critical to set up a security perimeter around the scene to prevent onlookers and media from intruding, as well as to prevent potentially injured/contaminated victims from leaving the scene. In a terrorist incident, this is all the more important as the perpetrators may still be

near the scene and a security cordon will prevent their escape. This concept of scene security was poorly managed at the World Trade Center in 2001, and it took far too long to establish an effective security perimeter.[8]

Summary

Scene safety and security are critical issues in disaster management. An all-hazards approach to disaster preparedness is not only essential for good planning, but is also essential for injury prevention. The role of the ISO within the IMS structure is pivotal in this regard. Healthcare providers and first responders must change their mindset from "patients ahead of self" to "safety first" and the ISO should reinforce this message at all times.

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