

RAPID CONTINGENCY PLANS FOR RESPONDING TO VICTIMS OF A CHEMICAL ATTACK

Handling Casualties and Decontamination



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All Americans are concerned about the potential threat of a chemical or biological terrorist attack. Such an attack could produce an overwhelming number of casualties, and nearby hospitals will be called upon to help manage both physical and psychological victims.

Excellent descriptions are available of comprehensive decontamination and triage facilities designed to handle such mass-casualty situations. However, such facilities take time to fully implement. This brochure discusses more immediate steps that hospitals can take to protect their facilities and staff, and allow them to provide safe and effective care for victims. The recommendations contained in this document are intended to assist hospitals in quickly developing a contingency plan for responding to mass casualty incidents.

This information is not intended as a substitute for more long-term planning involving building renovation, site preparation, specialized equipment purchases and corresponding training. The information in this brochure is not meant to be complete but to be a quick guide; please consult other references and expert opinion.

Regardless of a hospital's current decontamination capabilities, a plan can be quickly developed to handle mass casualties from a chemical or biological incident. Fear and panic are perhaps the greatest concern following a chemical or biological attacks. Fortunately, with some straightforward precautions and procedures, basic safety equipment and supplies, hospitals can develop the self-confidence and competency to respond to the emergency health care needs of victims from a terrorist attack, even before longer-term solutions can be implemented. This brochure also describes contingency plans for simple, easily and rapidly deployable decontamination procedures that can be quickly implemented. Because of the immediacy of effects from chemical warfare compared to biological warfare agents, this document focuses primarily on chemical agent victims (radiological incidents are not addressed).

SIMPLE OPTIONS FOR HANDLING CASUALTIES

A decontamination/triage facility is intended to protect hospital facilities and staff so that they can safely and securely carry out their health care responsibilities in a contamination-free environment. Ideally, a small number of suitably trained hospital staff with appropriate personal protection gear will meet victims at the entrance to the decontamination facility and assist them in completely disrobing, provide them a warm soapy shower, and temporary clothing. Simply removing a victim's clothing is probably the single most important decontamination measure. The decontamination facility is treated as the "Warm Zone," i.e. potentially contaminated through the presence of victims arriving from the scene of a terrorist attack.

Only after thorough decontamination will patients be transferred to the "Cold Zone," i.e., the main area of the hospital facility that will be free of contamination, where regular medical staff can provide appropriate care without being overly encumbered by the special equipment or unusual precautions required in the "Warm Zone."

In the initial confusion before a terrorist attack is recognized, hospital staff might be confronted with victims who have not been properly decontaminated. Therefore, this brochure describes some simple procedures for ER and outpatient receiving facilities to allow them to safely deal directly with victims who have not been decontaminated, should that occur.

Chemical Agents Hazard In Perspective.

Chemical warfare agents, both nerve and blister, are highly toxic materials that were intended to cause harm. Other agents that might be used in a terrorist attack such as industrial chlorine gas, are also very hazardous. Nevertheless, the individuals who are by far at the greatest risk are those at the site of the actual attack. Medical personnel who come into contact with these hazardous materials only through working with victims away from the attack site are at substantially less risk. Therefore, by taking simple precautions, medical personnel can readily provide care for victims with less risk to themselves. In fact, the basic elements of decontamination and triage for chemical weapon victims are the same as for hazardous materials victims — hospitals therefore should check if they have an on-site “Haz-Mat” team at their facility.

DECONTAMINATION PROCEDURES

All victims arriving at the decontamination/triage facility must be presumed to be contaminated.

Scenario 1 — Casualties arrive without warning.

Following a terrorist attack, victims quickly arrive at local hospitals without any warning of the nature of the attack or indeed that an attack has occurred. Under these circumstances, responding hospital facilities and staff (particularly ER) can become contaminated before they realize the nature of the emergency (a backup ER might be required in this circumstance). Therefore, ER staff should be prepared to quickly:

- Activate the full decontamination plan as soon as a chemical attack is suspected. Even if an ER facility becomes a contaminated “Warm Zone,” emergency decontamination of patients and ER equipment and patient flow control and security plans remain essential.
- Recognize the characteristic signs and symptoms of a chemical attack (pin-point pupils and excessive salivation for nerve agents; and skin reddening and eye irritation, and eventually skin blistering for blister agents).
- Be prepared to protect facility staff with at least a minimal face respirator and gloves (even simple face-masks designed to protect against pesticide spray and vapor exposure would provide some protection). Respirator protection is most critical, followed by skin protection with butyl rubber gloves, rubber boots, and non-porous protective outer garments such as Tyvek (see “Personnel Protective Equipment” below).
- Be prepared to quickly decontaminate victims by removing all clothing (plastic trash bags can be used for temporary disposal) and providing a warm shower with soap and shampoo. Lacking warm showers, a thorough sponge-bath with lots of warm soapy water will provide significant decontamination. Staff should be assured that decontamination itself is treatment.

- Have on-hand standard treatments for chemical agent poisoning, including atropine and 2-PAM to treat patients and hospital personnel, if required.
- Be prepared to replace or decontaminate potentially contaminated hospital equipment, including beds, gurneys, furniture, etc, with a warm soapy water wash-down.

Scenario 2 — Hospital staff are alerted to a terrorist attack.

At some point hospital staff will become aware that victims of a terrorist attack have arrived or will arrive at their facility. Simple decontamination procedures on victims prior to entrance to a hospital facility should be used to protect the facility and staff from contamination. Ideally, decontamination takes place outside the primary medical facility including the ER, to allow hospital staff to function without the need for special protective gear or procedures.

Additionally, patient privacy and modesty is a major concern. Many hospitals will not have suitable dedicated resources, but adequate privacy can be provided with temporary measures such as tarps, plastic sheeting and similar materials hung from buildings or simple support poles, or tents. An adequate security plan (discussed below) will also be required after being alerted to a terrorist attack. Thus, in a recognized terrorist attack, a medical facility should be prepared to:

- Use all the recommendations on protective gear, recognize the characteristic signs and symptoms of poisoning, and have on hand the appropriate treatments described above under scenario 1.
- Provide basic decontamination with removal of all clothing followed by a 5-minute warm shower with soap and shampoo, and a warm rinse. Permanent shower facilities are best, but temporary “camping style” portable showers set up outside would work well too.
- Implement a patient-flow and security plan to direct patients after thorough decontamination to the “Cold Zone” portion of the hospital, provide temporary dress in paper scrub outfits or similar clothing, and provide medical examination and direction to the most appropriate treatment location within the hospital.
- Be on the alert for patients with immediate or delayed signs and symptoms of toxicity, who should be directed through the decontamination line ahead of patients estimated to be less likely to become ill (see triage definitions below). Moreover, staff should be prepared to administer antidotes, such as atropine or 2-PAM, in the event of patients who succumb before decontamination is completed.
- Be prepared for non-ambulatory patients who will require assistance from hospital personnel equipped with at least minimal protection (face respirator and gloves), and disposable or easily decontaminated stretchers such as fiberglass stretchers designed for ambulances.
- Have security in place to keep patients from unintentionally recontaminating themselves. Once patients leave the decontamination facility, they should not be allowed to re-enter.

Key Issues: *Perimeter security, initial triage, gross decontamination, detailed shower decontamination/redress, re-triage, treatment, transportation to a higher level of care, patient discharge, general assistance, and internal security.*

Equipment Options:

1. *Existing showers at a hospital that can be made secure;*
2. *Portable outdoor “camping style” showers obtained from camping supply companies, set up in a parking lot. These showers have self-contained propane fired heaters and a simple fabric shower-stall, and require only set-up and attachment to a water hose;*
3. *Supply of outdoor hoses and adequate water supplies;*
4. *Temporary screened outdoor facilities for disrobing, such as plastic sheeting hung from poles, or tents. These also can be obtained from camping supply stores;*
5. *Soap, shampoo, towels, and temporary clothing such as hospital gowns;*
6. *Minimum protective equipment including respirator and skin protection (see below); and*
7. *Standard chemical agent antidotes.*

DECONTAMINATION/TRIAGE FACILITY REQUIREMENTS

Highly developed facilities rely upon two sets of staff: One in the “Warm Zone,” i.e., the external contaminated portion of the facility, and the other in the “Cold Zone” or non-contaminated portion of the hospital. Personnel are not allowed to move between the two zones.

- An ideal decontamination/triage facility would have male shower and locker room, female shower and locker room, large parking areas, good access roads, reliable electricity, heating, securable internal and external rooms for storage, and internal and external water supply. *The facility should be located well away from building air conditioning intakes.*
- Hospitals lacking such facilities could consider acquiring temporary tents, plastic sheeting, tarps and poles, and “camping style” portable showers, to be located in a hospital parking lot or other outdoor location.
- Every potential decontamination facility will have particular challenges such as an outdoor location (e.g., parking lot and tents), narrow corridors, or doorways, and stairs that do not allow stretchers or wheelchairs to pass easily.
- Cold weather conditions will determine the practicality of locating a decontamination facility outside of a building. The facility likely will become contaminated during its use. Wooden floors for example, are specifically subject to irreversible contamination, because they are porous.
- To increase hospital capacity and protect other patients, hospitals can also consider options including: discharging patients that can be moved to outlying facilities or to their respective homes; relocating some in-patient population to a ward unit or unused portion of the hospital; or, transferring patients to an alternate location outside the hospital.

PATIENT FLOW

Planning for patient flow is critical to the success of an emergency decontamination and treatment process for any medical facility. Once a building or temporary outdoor facility is identified, a plan must be developed to define how patients will move in and through the facility. It should be a “one-way” movement from entrance to exit to avoid cross contamination or recontamination.

TRIAGING PATIENTS EXPOSED TO HAZARDOUS AGENTS

Triage Categories:

Immediate - those who need to be admitted immediately to a hospital following initial treatment and stabilization. Such patients might not be ambulatory.

Delayed - those who require limited medical intervention for stabilization. These patients might eventually be admitted to a hospital or discharged following temporary medical observation.

Minimal - those who require a general assessment, but who can breathe spontaneously, are oriented to their surroundings and have adequate tissue perfusion.

Deceased - patients that arrive deceased or die at the facility. They may be placed in the temporary morgue, if necessary. Provisions must be made for mass casualties who die at the decontamination facility, like a refrigerated truck as a temporary morgue.

Psychogenic. Most victims will probably be ambulatory with perhaps only psychogenic effects - defined as persons who generally are without physical injury but believe that they have been harmed. In the 1995 Tokyo subway attack the ratio of worried-well to actually poisoned victims was about 5:1.

Disasters have a tremendous emotional and psychological impact on victims and rescuers. A terrorist incident will probably produce large numbers of psychogenic casualties who might quickly overwhelm existing hospital resources. The presenting signs and symptoms of these casualties can confuse the clinical picture, making triage decisions more difficult. These patients will need a medical evaluation and emotional support.

- Many types of patients might present at local hospitals following any event, including triaged “Minimal” patients from the scene that have been transported by emergency personnel, individuals responding to a public announcement of an event, and patients suffering from stress. Most will not have been decontaminated. Self-referring patients might also show up in a critical state.
- Most chemical agent liquid exposures (e.g., nerve agent) will produce immediate signs and symptoms; however, exposed patients presenting at the hospital with only mild signs and symptoms will likely not die from agent exposure.

- Many patients evaluated with minimal symptoms will not be incapacitated from the chemical exposure, but still need physical or psychological assistance.
- Some patients, especially the elderly, will be reluctant or even refuse to remove their clothing prior to showering. Parents with young children might not want them exposed to environmental elements especially in inclement weather. Provisions should be made for managing unaccompanied children.
- Plans should include how to handle patients that have difficulty ambulating. Decontamination areas will be slippery and staff might be needed to physically assist patients.
- Patients exposed to chemical agents could develop delayed symptoms. Hospital staff must be prepared to watch for patients who have deteriorated and assist them accordingly. Some chemical agents (e.g., mustard agent) produce delayed signs and symptoms, so exposed patients have a greater potential to cross-contaminate those with whom they come in contact later.
- Some facilities will elect to defer all triage until after complete decontamination except in cases where the patient is critically ill.

SECURITY REQUIREMENTS

An emergency security plan should be developed and tested as soon as possible by major medical facilities. Perimeter security is essential to maintain order, deter criminal acts, and provide for the safety of the public. Security of the entire hospital facility will be a major consideration. Most scenarios would involve a near lock-down of the hospital with controlled access to the decontamination/triage facility, and establishing signed separate entrances for victims and staff.

Perimeter security is the gatekeeper to the hospital and the decontamination facility. Preparations should include appropriate protective equipment (see below) that will allow law enforcement personnel to effectively operate in a contaminated environment.

Perimeter security plans also should address directing traffic and controlling traffic patterns. Many victims will arrive in their private vehicles, taxis, public buses, or on foot. Security plans must establish ambulance and bus drop off points, and private citizen vehicle parking.

Persons who arrive in their own vehicles might have unknowingly contaminated their vehicles. Hospitals must determine if they are going to release contaminated vehicles or if they will be quarantined.

TRACKING PATIENT BELONGINGS

Decontamination showering requires complete disrobing of victims, and the personal belongings will have to be treated as potentially contaminated and hazardous. The simplest option is to place clothing into bags such as plastic trash bags for latter disposal. If feasible, important personal items can be separated as durable (e.g., keys, cell phones, purses and wallets), and non-durable (e.g., all clothing, shoes, jackets, etc.). Non-durable goods will probably not be returned and will be disposed of, but durable goods could be returned if they can be decontaminated.

Optimal Supplies:

1. *Individual plastic bags for durables;*
2. *Large plastic trash bags for non-durables;*
3. *Tags for identifying bagged durables.*

PATIENT TRACKING

Some facilities could elect to begin patient tracking only after decontamination, leaving all data collection until the end of the process. Alternatively, a name and a triage tag identifier could be collected at the beginning of the process (e.g., during initial triage).

Tracking methods could include the use of a triage tag or medical chart number. Probably the best approach is to implement the tracking system that the facility is accustomed to using. If facilities use triage tags and triage tag numbers as unique patient identifiers, then these tags should be waterproof.

Even in a large-scale disaster, medical facilities should try to keep a running list of who was treated, what they received, and their clinical status at discharge.

After the staff has officially discharged patients from the medical facility, patients could still need some basic assistance before they are ready to leave. As part of a contingency emergency plan, a facility could consider:

- A collection point where patients can gather before they are transferred home or to a Reunification Center.
- A location where family members can reunite.
- A rest point where patients can sit for the first time to rest.
- A family-assistance desk where patients and relatives can talk to someone regarding individual concerns and gather information.
- A place where patients can make a phone call.
- Mental health support.
- More appropriate clothing.
- A means of returning home.

ACTIVATING THE DECONTAMINATION SYSTEM

As part of an emergency plan for responding to casualties of a terrorist incident, a notification system is needed to activate the hospital decontamination/triage operation and supporting staff. Assigned personnel will report directly to the hospital decontamination facility.

- The notification process should follow pre-established protocols and call-down lists. Automated emergency phone calls, reverse 911 systems, email, and/or automated fax notifications are methods to notify supporting staff of a decontamination system activation.
- The time required to activate the decontamination system will greatly influence its effectiveness in mitigating a mass casualty incident. Ideally, it will be operational within approximately one hour of notification.

STAFFING

An emergency situation could dictate a much simpler system, but nevertheless, the following critical functions could be considered:

- Perimeter Security
 - Initial Triage
 - Internal Security
 - Treatment Area
 - General Assistance
 - Supplies/Resources
 - Traffic Control
 - Gross Decontamination
 - Re-Triage
 - Out-Processing
 - Temporary Morgue
 - Transportation
- It will be useful to include one-page summaries of the tasks and responsibilities for each critical function that can be distributed to key staff in the event of an emergency.
 - Adequate training will be critical for ensuring that key staff will have the knowledge they need to carry out their function. One facility estimated that they required at least 8 hours training for each staff member.
 - Drills involving key staff, working with key equipment and supplies, will clearly improve actual response in a real emergency.

PERSONAL PROTECTIVE EQUIPMENT

Most fully developed emergency response plans for chemical or biological incidents specify that all personnel in contact with potentially contaminated victims (i.e., who must work in the “Warm Zone”) should use at least Level C personal protective equipment (PPE). Some authorities recommend use of even greater protection via level B PPE.

However, in the near-term, hospitals could find themselves facing an emergency situation without the benefit of level B or C PPE. In that case, and as an emergency contingency option only, some protection can still be obtained using simple face-mask respirator filters designed to protect against pesticide fumes and vapors, and rubber gloves.

- The primary protection hospital staff should use in working with potentially contaminated patients who have been removed from the actual site of the attack is high quality respiratory protection (masks) to protect their lungs and respiratory system. **Respiratory protection is the most critical component of personal protection.**
- Although protection against vapor absorption at the skin is secondary, liquid chemical agents could pose a danger from accidental touching or contact with the body of a victim, with a victim’s contaminated clothing, or with other contaminated objects. For these reasons, skin protection in the form of an impermeable, chemically protective suit made of Tyvek, and butyl gloves (in addition to a high quality mask) should also be worn to offer additional protection from these dangers.¹
- Appropriate face-mask respirators, gloves, and chemically protective suits can be obtained from local suppliers — check under “industrial equipment & supplies,” “safety equipment and clothing,” or even “hardware.”

With some pre-planning you can quickly develop a plan and procedure for dealing with an act of terrorism. In the long-run, more permanent solutions should be pursued.

LIABILITY ISSUES

Decontamination showers will produce potentially hazardous waste. However, according to the EPA,² a “good Samaritan” provision contained in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section 107 (d) (1), waives liability for actions taken while rendering care in an emergency involving the release of chemical and biological warfare agents due to a terrorist incident.

¹ Commercially-available protective suits evaluated at the Edgewood Chemical Biological Center at Aberdeen Proving Ground for protectiveness in “Cold” and “Warm” decontamination zones. They found that emergency personnel can be equipped with an effective low-cost clothing ensemble consisting of a high quality respirator, butyl rubber gloves and a commercial chemical over-garment (elastic wrists & hood closures with built in boots) that provides some liquid-droplet and vapor protection to the responder. This level of protection probably is adequate for personnel working on the perimeter (Cold Zone only) of an incident and also provides some protection in the area around the Cold/Warm zone boundary (i.e., assisting with the evacuation or decontamination process).

² United States Environmental Protection Agency, Office of Solid Waste and Emergency Response, “First Responders’ Environmental Liability Due To Mass Decontamination Runoff,” EPA 550-F-00-009, July 2000, www.epa.gov/ceppo/

SUMMARY — FIVE BASIC THINGS YOU CAN DO RIGHT AWAY

1. Establish a decontamination station in close proximity to the emergency entrance to your health care facility.
2. In collaboration with your local security personnel, establish a plan to tightly control access in and out of your facility in the event of an emergency. A controlled flow plan will clearly identify “Warm” and “Cold” zones, which together with a one-way patient flow scheme, prevent patients and staff from mixing between the two.
3. Establish a basic decontamination plan as part of the patient flow scheme. Patient disrobing is the most important component, and appropriate facilities can be simple privacy stations built from plastic sheeting and poles, or tents. Portable warm showers with soap and shampoo are also valuable.
4. Maintain a realistic perspective on the hazards of chemical agent attacks. Chemical agents are very hazardous, but in principle are no different than many other hazardous materials that patients can be exposed to. With education, proper preparation, and training, a hospital facility can respond effectively. An effective education program that reaches as many hospital personnel as possible is very important in preventing panic among staff members.
5. Personal protective equipment is required primarily for personnel working in the “Warm Zone” (the area prior to decontamination). Staff in the “Cold Zone” can do their jobs without being encumbered with special protective equipment. Ideally, most staff will be able to provide care in the “Cold Zone,” while fewer staff using special protective equipment will be needed to work in the “Warm Zone.”

For further assistance please contact Mark Brown, Ph.D., Director, Environmental Agents Services, U.S. Department of Veterans Affairs.

References: U.S. Army Soldier and Biological Chemical Command, Domestic Preparedness, Chemical Team (2000). Personal Protective Equipment for Use by Law Enforcement Officers at a Terrorist Incident Involving Chemical Warfare Agents. <http://www2.sbccom.army.mil/hld>

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