CHEMICAL HAZARDOUS MATERIAL DECONTAMINATION

Introduction

Hospitals must maintain the ability to decontaminate patients exposed to hazardous materials (HAZMAT). Most chemical HAZMAT incidents result in injury due to inhalation of vapors and gases or contact with a toxic agent. Contamination resulting from *ingestion* poses different hazards as significant residual toxins may be present in stomach contents and secretions, particularly after ingestion of organophosphates or metal phosphides. When deciding the capacity and scope of decontamination services the hospital will provide, it is critical to consider:

- Local industrial hazards
- Potential terrorist threats
- Proximity to major highways and railways
- The role of the facility in the community (e.g., trauma center)
- The size of the hospital.

Understanding regional assets for decontamination as well as sources of antidotes/medical countermeasures and how to request them is an important component of hospital HAZMAT planning. The hospital should also understand any specific chemical risks present on campus and the surrounding area, including associated research operations.

The hospital decontamination response is fundamentally different from the on-scene HAZMAT response where high concentrations of chemicals carry different risks. This chapter discusses some of the issues around decontamination of patients at a hospital, the equipment and personal protective equipment (PPE) needed to carry it out, and training and response considerations.

Related Resources
Additional materials are available in ASPR TRACIE's Chemical Hazards, Pre-Hospital Patient Decontamination, and Hospital Decontamination Topic Collections and Chemical Emergency Considerations for Healthcare Facilities.

ASPR also provides information on its Chemical Hazards Emergency Medical Management and Primary Response Incident Scene Management webpages.

Patient decontamination at the hospital protects the staff, prevents secondary contamination of the hospital environment, and reduces residual agent on the patient that could still be absorbed. Healthcare providers can be at risk, for example, from contacting highly toxic substances on patients' skin, clothing, or hair, or from inhaling off-gassing vapor from chemicals trapped in patients' clothing or hair. Fortunately, the amount of dangerous chemicals that can be brought to the hospital on the bodies of living patients limits the risk to hospital providers. Rather than being first responders, hospitals are, in the terminology of the Occupational Safety and Health Administration (OSHA), "first receivers" of potentially contaminated patients because of this lower level of exposure compared to at the scene of release.

Emergency medical services (EMS) should alert the hospital as soon as an incident is recognized so that the hospital can be prepared. The hospital should understand area EMS protocols for management of potentially contaminated patients. Most EMS agencies will not transport patients who are recognized as contaminated. However, many patients contaminated by hazardous materials arrive at the hospital by private vehicle or ambulance without any prior decontamination.

Even when patients have been decontaminated at the scene, an emergency or gross decontamination process may not have been sufficient. These patients often need additional decontamination at the hospital to avoid continued and secondary exposures. Fire department and other providers of decontamination services should be involved in joint training with the hospital to augment hospital decontamination services if/when their resources permit. The hospital should know what pre-hospital decontamination resources are available and what to expect and not to expect from local public safety services. In some cases, private contractors are available to support hospital decontamination services; these resources must be understood and contracted ahead of an incident. While they will not arrive in time to start the decontamination process, private contractors can be a helpful supplement in larger or more complicated incidents. In all chemical HAZMAT exposures, the poison control center should be contacted to provide management advice.

Regulations

Some aspects of the Hazardous Waste Operations and Emergency Response (HAZWOPER) standard[1] (29 CFR 1910.120) apply to hospitals, in particular the initial training and refresher standards. Members of the hospital decontamination team will be wearing respiratory protection subject to the respiratory protection standard 29 CFR 1910.134, the same standard that applies to respirators worn for infection prevention uses.[2]

[1] Frequently Asked Questions: HAZWOPER

[2] OSHA Respiratory Protection Standard 29 CFR 1910.134

While disposal of contaminated wash water is subject to federal Environmental Protection Agency (EPA) regulations, EPA has a Good Samaritan clause that precludes action during a public safety response for contamination of water or ground occurring during emergency decontamination operations as long as the entity is not grossly negligent and there is no willful misconduct.[3] Hospitals are obligated to try to control wash water for smaller decontamination events involving a number of patients for which the hospital should reasonably be prepared.

Related Resource
The OSHA Best Practices for Hospital-Based First Receivers of Victims from Mass Casualty Incidents Involving the Release of Hazardous Substances is a must-read for personnel managing a hospital decontamination program.

State agencies may have additional requirements relevant to decontamination and disposal of contaminated water; hospitals should be aware of the regulations and any notifications that may be required (e.g., to state pollution control agency and local treatment plant if contaminated water is discarded). Finally, the OSHA General Duty clause allows enforcement actions if a dangerous hazard was known or could reasonably have been anticipated but was not mitigated.[4]

Though not regulations per se, the National Planning Guidance from the U.S. Department of Homeland Security (DHS) and the Primary Response Incident Scene Management (PRISM) documents from HHS should be followed as national guidelines.[5,6]

Decontamination Concepts and Process

Dry Decontamination

Dry decontamination is the mainstay of risk reduction. The dry decontamination process includes removing a patient's clothing and personal belongings and placing them in a large, sealed plastic bag (which should have a unique identifying number corresponding to the number on the patient's triage tag or disaster medical record) and then wiping any skin contaminant off with adsorbing material like washcloths, wipes, or even paper towels. Note that impermeable belongings such as glasses can and should remain with the patient.[7]

Stripping clothing should remove approximately 90% of contaminant (on average) and combined with wiping can reduce contamination by 99%, particularly when the substance is not

[3] First Responders' Environmental Liability Due to Mass Decontamination Runoff
[4] General Duty Clause
[5] Patient Decontamination in a Mass Chemical Exposure Incident: National Planning Guidance for Communities
[6] PRISM: Primary Response Incident Scene Management: Guidance for the Operational Response to Chemical Incidents
[7] Some belongings, such as those of law enforcement officers, will require special handling, securing, and larger bags.

water-soluble.[8,9] Ideally, the hospital should have pre-prepared dry decontamination materials and redress kits on hand, which may include a towel, flip-flops, and a gown/suit or large plastic bag for the patient to wear while awaiting further decontamination. Patients can be instructed in dry decontamination activities without direct provider contact, which limits exposure and the number of providers who need to wear PPE. Ideally, patients should not remove heavily contaminated shirts over their head, particularly if a caustic agent is involved, to avoid eye injuries and additional hair contamination. These patients may need assistance cutting off clothing.

From the Field
Prior to a national political convention, a hospital near an event venue prepared 1,000 dry decontamination kits, including large black plastic drum liners with neck and arm holes for patients to undress under, numbered tags/bags for clothing and valuables, and instructions for patients.

Overall, the dry decontamination process is more important than wet decontamination and may be the only decontamination indicated (e.g., for gases such as hydrogen cyanide or carbon monoxide and vapors such as chlorine that leave no significant residual on skin). Wet decontamination should only be used when the contaminant is liquid, caustic (e.g., provokes skin irritation), or is particulate in nature. If the exposure was due to a splash of liquid, only those areas exposed need wet decontamination.

The Decontamination Area

Optimally, a decontamination room has two-way access, preferably from an external doorway near the EMS entrance and an internal doorway into the emergency department (ED). The area should be well-ventilated and well-lit, internally and externally. Air circulation in the decontamination area should not re-enter the hospital HVAC system. Additional exhaust fan capacity—both built-in and portable—is recommended so that gases do not accumulate in the decontamination room during decontamination operations.

The area should be configured and have equipment for decontamination of ambulatory and non-ambulatory patients. A method for control of wash water should be present that accommodates the needs of smaller incidents. This may include a holding tank, a reservoir bladder, collecting tubs/pools, or other systems. When a HAZMAT mass casualty incident exceeds these containment capabilities, ideally, wash water should be directed down the sanitary sewer (rather than the storm sewer, which does not get treated prior to entering the watershed).

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[8] Southworth, F., James, T., Davidson, L., et al. (2020). A Controlled Cross-over Study to Evaluate the Efficacy of Improvised Dry and Wet Emergency Decontamination Protocols for Chemical Incidents. PLoS One. 15(11):e0239845.

[9] Chilcott, R., Larner, J., Durrant, A., et al. (2019). Evaluation of US Federal Guidelines (Primary Response Incident Scene Management [PRISM]) for Mass Decontamination of Casualties During the Initial Operational Response to a Chemical Incident. Annals of Emergency Medicine. 73(6):671-684.

Ideally, the area would include showers with privacy protection, either in a dedicated decontamination room or piped into climate-controlled ambulance garages or other locations for emergency use. The decontamination room can also be used to wash patient carts and for showering patients in cases of infestation. Tempered water sources should be available, ideally with a maximum temperature of 104F/40C. Cold water sources are not advisable as they are uncomfortable – limiting decontamination effectiveness – and may pose a risk of hypothermia. Ideally, the showers would be equipped with wall-mounted soap dispensers and timers so that decontamination personnel can support and monitor the patients. Soap bars and washcloths are workable alternatives.

Some hospitals may only have a temporary portable shower, but these take significant time to set up and the water flow rates may not be sufficient for rapid decontamination. If portable systems are used, the connecting hose must be connected to a tempered, monitored water source. Hose lines are a trip hazard and should be covered.

For non-ambulatory patient decontamination, dedicated trays are marketed that can be placed on top of a patient cart and will contain wash water for single victim decontamination. Roller systems may also be used along with backboards to move patients through a decontamination line. Decontamination team members should exercise caution when deploying these due to pinch hazards and the potential to catch and tear PPE.

Depending on the hospital's resources to augment capacity, temporary tenting and shelters may be helpful, particularly to serve as a holding area or dry decontamination area in a mass casualty situation. The same caveats apply to portable tenting for non-ambulatory decontamination as ambulatory decontamination.

Additional Materials

Disposable washcloths and gentle dishwashing soap should be available in large quantities. Trauma scissors (for clothing removal), towels, and gowns should be available in a cart (and may be needed in large quantities). Small collection pools or tubs may be used to contain wash water if there is not a dedicated containment tank/bladder or other system. Bleach should be available to be used on equipment but not on patients. Additional hoses and nozzles with settings for high-flow low-pressure (e.g., "rain" setting) should be available. In-line temperature sensors can be very helpful on the non-ambulatory decontamination line. The hospital may wish to use tags or stickers to demonstrate completion of the decontamination process; these may also be used to associate a patient with a belongings bag. Collection bins/laundry baskets/other containers for belongings should be available. Laundry baskets can also be used to carry infants through the decontamination process. Shower chairs/walkers can be very helpful in case a patient has difficulty standing throughout the process. Although they do not need to be in the decontamination room, barrels or bladders that can be used to contain wash water and then sealed should be available at the facility. A pool or a submersion pump may be very helpful to drain collection pools into these vessels.

Decontamination Process

Once hospital decontamination team members are activated, at least two should don PPE. Generally, a trained "buddy"' is needed to help don PPE safely and quickly. Ideally there is a designated donning and doffing area available, and a quick medical check is performed on the team member(s) prior to their donning PPE. This is a required element for responders entering a release scene, but not traditionally for hospital decontamination team members. Still, many hospitals incorporate it into their planning process. Note that a post-decontamination operations medical assessment is required.

Providers should determine the type of exposure. True gas exposures (e.g., carbon monoxide) do not require skin decontamination. Some gases do leave residual on clothing that may be irritants for caregivers and require dry decontamination (e.g., chlorine, ammonia). Vapor (especially a nerve agent), liquid, and powder exposures will require wet decontamination. If there is significant powder on the clothing, it may be helpful to gently wet this area down just prior to clothing removal to prevent re-aerosolization. Eye exposures may require specific and (in cases of alkaline exposures) prolonged decontamination and are outside the considerations of this guidebook.

The specific decontamination process will vary depending on the hospital layout and capabilities. It may be helpful to have signage on the walls or indicators on the floor showing the flow of the process and designating warm and cold zones. Signage can also indicate the process for both dry decontamination and, in the shower areas, wet decontamination. Prerecorded instructions can also be played in a continuous loop. Multilanguage instructions should be prepared depending on community demographics.

There should be a process to move a walk-in patient recognized as contaminated with a hazardous substance safely to the decontamination area. Having a few dry decontamination kits at the main hospital entrance/triage may be a good idea as dry decontamination may be initiated at the first point of contact.

The hospital decontamination area should be prepared according to the expected number of patients and type of exposure. Once the ambulance arrives at the hospital, a triage officer in PPE should receive patient report from the EMS provider prior to the patient being removed from the ambulance. At this point, it may be determined that clothing removal is the only intervention needed and the patient may be taken into the ED without further decontamination. When the situation is uncertain, the default should be to provide wet decontamination. Some patients may insist on showering even when not indicated, and this should be allowed if resources permit. Other patients will refuse decontamination. If the patient is willing to perform dry decontamination this may be appropriate though it should be approached on a case-by-case basis. Generally, if the patient refuses dry decontamination, they should be medically screened and released. If their condition requires emergency treatment, an experienced provider should be consulted and an individual plan developed that considers the risk to the patient and providers.

A plan for patient flow for both small and large incidents should maintain a progression from a safe holding area for clothing removal and dry decontamination to a wet decontamination area, ideally with separate lanes for non-ambulatory and ambulatory decontamination. At least one experienced team member in PPE should be available to perform triage if a large number of victims are present. Given the relatively small added benefit from wet decontamination in most cases, consideration should be given—particularly in mass casualty incidents—to providing only dry decontamination if the risk of wet decontamination likely exceeds the benefit (e.g., elderly person contaminated with an agent that poses relatively low risk) or prioritizing those with the highest degree of contamination if resources do not allow wet decontamination of all patients. The plan should also specify at what point wash water control is no longer possible and what mitigation will occur (e.g., use of absorbents or "pig" drain covers prior to the drain) as well as what notifications to the local/state water authority need to be made.

If the contamination is contained to a specific area of the body such as the hands, local decontamination may be performed with soap and water. Soap and water decontamination of intact skin is relatively straightforward. Patients may require assistance with cleansing and temporary dressings of wounds. When washing hair, it is important to have the patient bend over so the water draining off the hair does not drain onto other areas of the body. Because hair is a usual location of significant residual contaminant, washing hair while in a standing posture may result in contamination of otherwise clean areas of the body. The area between the shoulder blades is commonly an area that is not washed well; if the back is contaminated, the patient may need assistance with washing this area. Active drying of skin and hair with a towel is an important step, as it may also help to remove residual contaminant. Decontamination of reactive metals and other specialty hazardous materials is unusual and beyond the scope of this guidebook.

Plans and training should address the needs of pediatric patients and those with mobility, hearing, and other limitations. Parents/guardians should be instructed whenever possible on accompanying and assisting with their child's decontamination process. Family members should be kept together if possible. If a parent is not available, a team member will need to escort the child through the process and hand them off to a "clean" provider after decontamination is completed. Infants may need to be decontaminated on towels set in laundry baskets but careful consideration for the risk/benefit should be performed as hypothermia is a significant risk. Any patient with gait or mobility issues will require additional staff resources to accomplish safe, effective decontamination. Wet, soapy floors are a major fall hazard even for those without mobility impediments.

Generally, decontamination team members providing non-ambulatory decontamination should be rotated every 20 minutes; those who are supervising ambulatory decontamination activities (during which most patients are performing self-decontamination with direction from a team member) or fulfilling tasks such as handing out towels may comfortably rotate on a less frequent basis. The ambient temperature and other factors will influence rotation times. Replacement personnel (if needed based on the scope of the incident) should begin suiting up after the initial team has been providing decontamination for about 10 minutes. The

decontamination team leader should be prepared to continue to add and rotate team members as needed for the duration of the incident.

Considerations

In some cases (e.g., for organophosphate/nerve agent or opioid incidents), administration of injectable medications or basic airway management (e.g., OP airway and BVM use) may be required during the decontamination process. These interventions are more difficult to perform when the providers are wearing PPE and specific training is recommended for at least a few members of the decontamination team.

After decontamination operations are complete, the providers generally will perform decontamination on themselves while in PPE to reduce contaminant on the suit and respirator surfaces. Following that, they should inspect their PPE. If there are any tears in the suit, the team member may need to doff the PPE and then proceed with decontamination depending on the chemical and level of exposure. After doffing PPE, team members should hydrate and undergo a medical evaluation. This should include obtaining vital signs and a general medical assessment for signs of injury, contamination, or dehydration. The assessment should be documented in the medical record or on a surveillance form filed with employee health.

A post-incident hotwash should capture any issues or lessons learned. Information about the chemical should inform decisions about returning clothing and belongings to the patients. The safety manager should direct the cleanup of the decontamination area and the disposition of wash water. In most cases, the concentration of chemicals will be so low that this area can be cleaned as usual and the wash water discarded. However, in some cases an approved hazardous waste contractor may need to dispose of the wash water and special detergents or cleaners may be needed for the decontamination area.

Personal Protective Equipment (PPE) for Chemical Hazards

Most hospitals elect to protect their teams with level “C” PPE including a powered air purifying respirator (PAPR) with chemically protective suit, gloves, and boots. This is consistent with the OSHA first receiver guidance. Note that this ensemble is appropriate for hospital-based decontamination activities only and may not be used in a release (i.e., “hot”) zone or any oxygen-deficient environment. Combination canisters for the respirators should at minimum include a HEPA filter and filters for organic vapor and acid gases to address the most common threats to decontamination personnel. First responder and other types of canisters can offer higher levels of protection against a broader range of chemicals, if desired. The PAPR hood should be made of chemically resistant fabric or butyl rubber. It should have an inner and outer shroud. The inner layer is tucked into the suit to provide additional respiratory protection. Note that PAPR hoods for infectious disease and many industrial applications do not offer adequate chemical protection and are not suitable for decontamination purposes.

A variety of chemically resistant suits may be worn to protect against splash/contact hazards. A balance between protection and flexibility/mobility should be considered. Protective suits suitable for scene response are often very stiff and expensive. However, suits used for many industrial and laboratory applications do not offer adequate chemical resistance and these suits should not be used by the decontamination team. The hospital should choose a suit with adequate chemical protection for their anticipated community hazards. A variety of sizes should be stocked, recognizing that protective suits often run small. Suits are available with or without integrated hoods and feet. This is a matter of institutional preference, however, if a hooded version is used, the hood must be tucked in prior to donning the PAPR.

Butyl rubber or chemically resistant booties are designed to be pulled on over shoes but are often difficult to get off and on and do not offer significant abrasion resistance. Butyl or other chemically resistant boots offer better protection but take up more space and are more expensive. Hospitals should ensure that a variety of sizes are available.

Usually, a long-cuffed nitrile inner glove is combined with a heavier butyl rubber over glove to protect the hands. Chemically resistant tape or duct tape should be used to seal the junctions between the suit and the boots and gloves. Depending on the fit and material of the outer glove, some hospitals add a tighter third glove to improve dexterity.

From the Field

The predominant injury to hospital providers has been airway irritation from gas (e.g., chlorine, ammonia) residuals on clothing. In almost all cases where providers were adversely affected, they were *not* wearing PPE. In Tokyo, Japan, hospital providers developed signs and symptoms of nerve agent poisoning and a few required antidotal therapy after providing care to a large number of sarin vapor victims. In rare instances, treating clinicians have been sickened by exposure to off-gassing toxic chemicals in stomach contents after ingestion, such as organophosphate pesticides and metal phosphides, which produce phosphine gas in the presence of moisture and acid. In the known cases of hospital personnel adverse effects, clothing removal has *not* been performed and should be a priority.

Related Resources:

- Secondary Contamination of Medical Personnel, Equipment, and Facilities Resulting from Hazardous Materials Events, 2003-2006
- The Tokyo Subway Sarin Attack: Disaster Management, Part 2: Hospital Response
- Nosocomial Poisoning Associated with Emergency Department Treatment of Organophosphate Toxicity--Georgia, 2000

Using Toxidromes to Diagnose and Treat

Providers should be trained to utilize toxidromes for decision support on the type of chemical to which patients may have been exposed. Toxidromes describe a set of signs and symptoms that are commonly associated with toxicity from a category of chemicals, such as organophosphate nerve agents and pesticides, opioids, and vesicants. Toxidromes can be readily identified with a few observations of patient

signs and symptoms, facilitating quick decision-making in situations where the patient may be experiencing rapidly progressive adverse health effects and diagnostic tests are not available.[10] Poison control centers are available for consultation on both patient diagnosis and medical management.

Organophosphate/carbamate agents and nerve agent toxidromes should be readily recognized, due to the risk to providers and the ability to treat with antidotes. Patients may be exposed to these agents through vapor, contact with liquid, or ingestion (accidental or suicidal). Toxic effects cause stimulation at *all* nerve endings with resultant muscular irritability as well as dramatic secretory and motility effects. Thus, key features of the cholinergic toxidrome involve small pupils (miosis) in conjunction with hypersecretory states with pulmonary and nasal congestion, tearing, and sometimes vomiting and seizures (i.e., DUMBELS, or diarrhea, urination, miosis, bronchospasm/bradycardia/bronchorrhea, emesis, lacrimation, salivation). Rapid treatment with atropine to improve ability to ventilate is the key intervention. Pralidoxime (2-PAM) may be helpful in nerve agent/organophosphate poisonings to prevent ongoing toxicity.

Although petroleum products are noxious and are the most common reason for a HAZMAT response, chlorine results in more injuries than any other hazardous material and is worth

Considerations

Agricultural and household incidents involving organophosphate or carbamate agents are not uncommon and patients may require significant quantities of atropine. Depending on the regional risk and assets, consideration should be given to stocking a significant quantity of atropine. In addition to emergency department atropine, hospital pharmacies likely will need to emergently provide large quantities of atropine for organophosphate exposure. Crystalline USP grade atropine has been proposed as a potential mass casualty solution. Atropine eye drops are a contingency source of atropine (10mg/mL for 1% drops) that can be given sublingually to control secretions and allow ventilation.

specific consideration as large numbers of victims are possible, including those with severe airway injury.[11] Generally, dry decontamination is recommended when nuisance levels of gas/vapor are trapped in fabric. Otherwise, no specific decontamination is required. The primary concern is airway management. Effects tend to peak within the first few hours and can involve upper airway swelling as well as pulmonary edema. Therefore, the focus after these incidents is to provide clothing removal and then focus on medical management.
Opioids are another threat that warrants consideration of stocking medical countermeasures. Malicious dissemination of fentanyl powder has not yet been observed to cause a mass

[10] Ciottone, G. (2018). Toxidrome Recognition in Chemical-Weapons Attacks. The New England Journal of Medicine 378(17):1611-1620.

[11] Wenck, M., Van Sickle, D., Drociuk, D., et al. (2007). Rapid Assessment of Exposure to Chlorine Released from a Train Derailment and Resulting Health Impact. Public Health Reports. 122(6):784-792.

intoxication but is plausible and could require many doses of naloxone as well as potential decontamination of the powder.

Though the risk of a terrorist incident involving nerve agents is low, it is a plausible scenario for which the CHEMPACK medical countermeasure program of the Strategic National Stockpile (SNS) exists.[12] CHEMPACKs contain atropine, pralidoxime, and a benzodiazepine (diazepam or midazolam). Hospitals should be aware of CHEMPACK assets in their area and how they are requested or activated, their contents, and administration. In most cases, the state, territory, or tribe within which the hospital resides has a CHEMPACK coordinator who works with the SNS and local hospitals, EMS, and other response organizations. How CHEMPACK assets will be distributed to locations that need them should be the subject of regional operational planning. Recommendations on establishing and maintaining hospital and regional stockpiles of medical countermeasures and other supplies have been published.[13][14]

Another common HAZMAT-related phenomenon occurs when multiple persons experience an odor or similar trigger and experience a variety of symptoms and manifestations such as nausea and vomiting in the absence of any clear chemical leak.[15] Close examination of pupils and for secretions should separate this from cholinergic toxidrome. Symptoms, setting, and scene and laboratory testing can rule out carbon monoxide. In the absence of any history of liquid or vapor exposure, no decontamination is indicated.

Staff Considerations and Training

Staff participating in decontamination activities must be trained to the OSHA First Responder Operations (FRO) level. This involves eight hours of training, or "to competency." Note that this training does not include the ability to respond to the scene of a release, whether that occurs on the hospital campus or elsewhere. CFR 1910.120(q)(6)(ii) sets out the training requirements for FRO level. These elements as well as First Responder Awareness level (no training duration specified) must be included in the decontamination team training.

Training may be delivered by a variety of modalities including virtual; however, the participants must be able to demonstrate competency with the donning and doffing of PPE and provision of decontamination. Many hospitals provide online didactic training and a few hours of in-person training. Refresher training must be provided yearly and should include competency for PPE donning and doffing and information about hazard recognition and the

Related Resource
Training resources are available in the ASPR TRACIE Hospital Patient Decontamination Topic Collection.

[12] CHEMPACK
[13] Rebmann, T., McPhee, K., Osborne, L., et al. (2017). Best Practices for Healthcare Facility and Regional Stockpile Maintenance and Sustainment: A Literature Review. Health Security. 15(4):409-417.
[14] Dart, R., Goldfrank, L., Erstad, B., et al. (2018). Expert Consensus Guidelines for Stocking of Antidotes in Hospitals That Provide Emergency Care. Annals of Emergency Medicine.71(3):314-325.
[15] Wessely, S. (2000). Responding to Mass Psychogenic Illness. The New England Journal of Medicine. 342(2):129-130.

institutional response. There is no specified amount of time for refresher training. Recently, some healthcare coalitions have found it beneficial to devise standardized response plans and training for their hospital members to optimize limited training and response resources. Some healthcare coalitions have also standardized chemical PPE in their area to facilitate caching and sharing of resources.

A variety of hospital personnel can serve as members of the decontamination team. This may include healthcare assistants, environmental services, nurses, and physical therapy staff.

Considerations
If a mass casualty HAZMAT incident occurs, the hospital may need to activate both mass casualty and decontamination response plans. The hospital should clearly identify what lifesaving patient care interventions can be performed prior to decontamination and what steps are needed after intervention to minimize risk. Security should have plans to implement access controls to prevent contaminated individuals from entering the hospital. At larger facilities, strong consideration should be given to training and equipping security to operate in chemical PPE for crowd control and staff safety.

Trained staff should be available to initiate a decontamination response 24/7. This is likely to be a relatively small number of personnel who should be supplemented by a decontamination team leader and the facility safety director and/or emergency manager. Having at least some clinical personnel trained in PPE use and decontamination is important so they can perform triage and initial interventions during a contamination incident.

HAZMAT awareness training for security and other front line hospital staff may help them recognize a potential HAZMAT incident, for example, when victims present at the hospital without prior notice and/or without being transported by EMS, fire services, or law enforcement.

Related Resource
ASPR TRACIE's Healthcare Coalition Chemical Emergency Surge Annex Template can help communities coordinate the medical response to a chemical incident.

Conclusion

Hospital decontamination programs are essential and require a significant level of ongoing commitment as well as cooperation among security, safety, emergency management, emergency department, infection prevention (for respiratory protection components), and other disciplines/departments. Effective training with a scaled plan to address usual single or few victim incidents as well as mass casualty incidents is important, as is an understanding by frontline personnel about when decontamination is indicated.

From the Field
One urban trauma center trains all healthcare assistants and emergency medicine residents to FRO standards with refreshers as part of annual competencies. Another rural hospital trains their ED charge nurses and environmental services staff to the FRO level. Should the ED charge nurse have to don PPE, the inpatient nursing supervisor supports ED operations.