An EMS protocol for responding to potential hazardous materials incidents should consider: (1) activities to undertake en route and upon arrival at the scene; (2) guidelines for assessment, decontamination, and treatment of affected persons; and (3) patient transport to the hospital. Steps in the protocol must be practiced before a hazardous materials emergency occurs. EMS personnel should know their responsibilities and how to perform them, and all required equipment should be readily accessible and ready to use.

En Route to a Hazardous Materials Scene

First responders must be alert for hazardous materials when responding to every call. The dispatcher may provide information such as unusual signs and symptoms (e.g., pungent odor, eye irritation) or the address might suggest that the call may involve a chemical release. The presence of hazardous materials may be obvious, as in the case of noxious fumes, gasoline, or corrosive liquid spills. In other situations, the hazardous nature of the chemical(s) may not be immediately apparent, as with odorless but poisonous and/or flammable vapors and liquids, or radioactive materials. If a vehicle has a diamond-shaped placard or an orange-numbered panel on the side or rear, the cargo should be assumed to be hazardous. Unfortunately, not all hazardous materials transport vehicles are clearly marked. Many delivery trucks regularly carry hazardous materials that could be released in a collision, yet the appropriate signage is often missing. Therefore, first responders should use caution when attempting rescues at any incident scene. The hazard, or lack thereof, must be determined immediately before first responders enter a chemically contaminated area.

While in transit to an incident scene, the responder should pay attention to clues that suggest the possibility of hazardous materials. For example, billowing smoke or clouds of vapor could indicate the presence of a dangerous substance(s). The senses are among the best tools for detecting chemicals, particularly the sense of smell. Should an odor be detected, however, responders are advised to move a safe distance away until they ascertain its source. Failure to do so could result in injury, illness, or death. Despite their value, sensory signals, such as smell, color, and nasal or eye irritation, are not always reliable indicators. Their presence depends on the chemical(s) involved and on the surrounding conditions. The nature of an incident is also key to identifying the possibility of hazardous materials. Accidents involving railroad tank cars or tanker trucks, or incidents at fixed locations where chemicals are used or stored, often indicate the presence of hazardous materials.

Emergency responders should pay attention to factors such as wind direction and topography when approaching a suspected hazardous materials incident and advance upwind and upgrade of suspected chemical emissions. They also need to consider that low-lying areas such as streambeds and gulleys, or in urban areas places such as courtyards or near tall buildings, may contain vapor clouds protected from dispersal by the wind.

Responders should attempt to gather as much information as possible while traveling to an incident. A checklist to help determine initial actions should be developed and made available to all EMS personnel. It should include:

- Type and nature of incident
- Caller s telephone number
- Knowledge of whether a chemical(s) may be involved
- Chemical and trade name(s) of substance(s) involved
- Number and ages of victims
- Signs and symptoms being experienced by the patients
- Nature of injuries
- State of the material (solid, liquid, gas)
- Routes of exposure (inhalation, dermal contact, etc.)
- Length of exposure

Using as much information as can be gleaned en route, emergency responders should relay their observations to a predesignated resource center (e.g., regional Poison Control Center, ATSDR) for information regarding definitive care procedures. If a hazardous substance has been identified, responders should locate specific information on the chemical(s) by consulting reference guidebooks, websites, database networks, telephone hotlines, MSDSs, and the DOT s *North American Emergency Response Guidebook,* in addition to the designated resource center (see Section I Hazard Recognition). Chemical-specific information can help identify possible health hazards, including: (1) the nature of possible injuries; (2) potential routes of exposure; (3) risk of secondary contamination; (4) required PPE; (5) the need for decontamination; (6) decontamination procedures; and (7) the appropriate safe distance from the hazard to protect EMS personnel, the public, and property from exposure to contaminants or other dangers such as fire or explosion. If available, preplans should be reviewed to assist with locating proper vehicle staging locations, evacuation routes, and patient treatment centers. This information may also be available from a command post, if one has been established.

Communications with other agencies or services should also be initiated while en route to the event site. If an Incident Command System (ICS) has been implemented, the Incident Commander (IC) will identify the best approach route, the possible dangers involved, and the estimated number of injuries. Communications between onsite response personnel and receiving facilities should be kept open to relay as much advance information as possible. Communications should also be established with local fire and police departments, and with the hazmat response team, if appropriate.

Arrival at the Scene

Many first responders (e.g., police officers, the fire-rescue squad, EMS personnel) are accustomed to immediately attending an injured victim, often disregarding the possibility of danger to themselves. In such cases, a rescuer entering a contaminated area also risks exposure and the potential to become another victim. Even though rescue of an injured patient is important, it should only be attempted without undue risk to the responder(s). While training and experience are valuable in these situations, often these types of decisions are, at best, a judgment call. Rescue should only be attempted by trained and equipped EMS, fire department, or hazardous materials response team personnel. Exhibit III-1 illustrates a typical decision tree for making choices about risk and response.

Upon arrival at a scene, an initial assessment of the nature and extent of the incident should be conducted and additional support requested, if necessary. A first-in responder should also confirm that local authorities have been notified and are aware that hazardous materials might be involved. Onsite assistance should include police, fire, and health departments; the hazmat response team(s); and the local industry response team(s). Unless otherwise directed, responders should park at a safe distance that is upwind, upgrade, and pointing away from any incident where hazardous materials are suspected. Safe distances for specific chemicals may be determined from the DOT s *North American Emergency Response Guidebook,* or by consulting CHEMTREC or other written or electronic references. Responders must also remain alert to the possibility that the incident is the result of an intentional criminal act, with the presence of secondary devices intended to injure emergency personnel.

General guidelines for responders include:

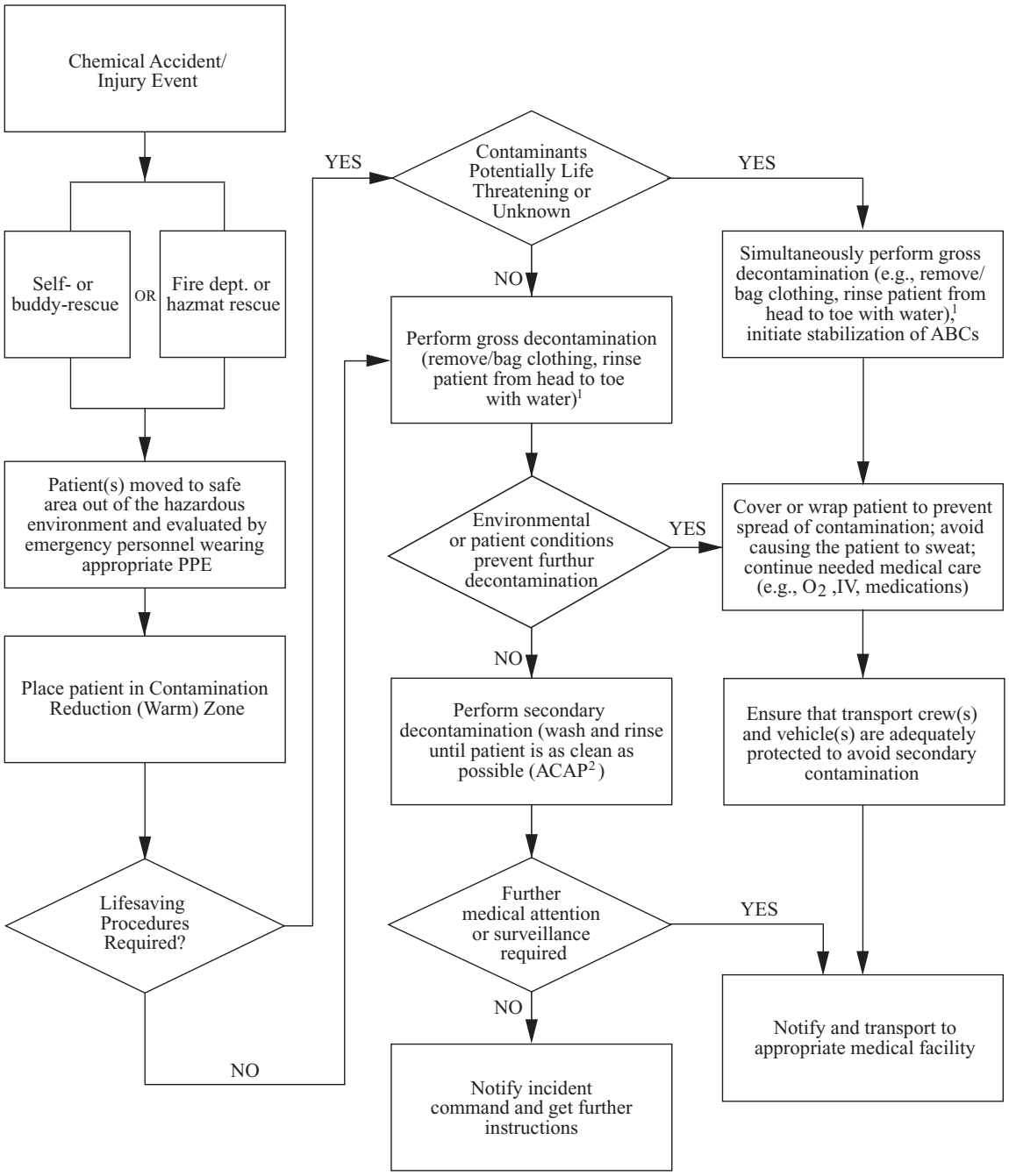
- Do not drive or walk through any spilled or released materials, including smoke, vapors, and puddles.
- Avoid unnecessary contamination of equipment.
- Do not attempt to recover shipping papers or manifests unless adequately protected.
- Avoid exposure while approaching a scene.
- Do not approach anyone coming from contaminated areas.
- Do not attempt rescue unless trained and equipped with appropriate PPE for the situation.
- Report all suspicious packages, containers, or people to the command post.

The first units to arrive at a large industrial or storage facility, transportation accident, or a mass gathering location should anticipate a rush by evacuating victims. Proper steps must be taken to keep responders from becoming contaminated or otherwise harmed (e.g., use of a PA system to give instructions).

The top priority for first responders is scene isolation. Keep others away! Keep unnecessary equipment from becoming contaminated by giving exact information on safe routes of arrival and vehicle staging locations, and by reporting anything suspicious.

First responders should immediately establish an Exclusion (Hot) Zone, taking care not to become exposed during the process (see Exhibit II-11). The Exclusion Zone should encompass all contaminated

Exhibit III-1
Sample EMS Decision Tree for Chemical Incidents



[1] No patient should be transported without a minimum of gross decontamination performed.

[2] Contamination reduced to a level that is no longer a threat to patient or responder (once achieved, move patient to the Support [Cold] Zone).

areas, and no unauthorized personnel should be allowed to enter that Zone. Anyone leaving the Exclusion Zone should be considered contaminated, requiring assessment and possible decontamination. Additional zones, including a Contamination Reduction (Warm) Zone and a Support (Cold) Zone, should be delineated at the first available opportunity. Depending upon available personnel, this may be the primary responsibility of the Incident Commander (IC) or of responders other than EMS. *Do not remove nonambulatory patients from the Exclusion Zone unless properly trained personnel with the appropriate PPE are available and a decontamination corridor has been established.* The IC should coordinate patient evacuation and emergency care activities. A public address system (e.g., bullhorn, siren PA system) can be effective for directing ambulatory patients on what to do and where to go.

EMS responders who are not properly trained and equipped should stay out of the Exclusion and Contamination Reduction Zones. While it is recommended that all EMS personnel be trained and equipped to work (at a minimum) in Level C PPE protective attire (see Section II), this does not provide maximum skin or respiratory protection. Entry into a Hot or Warm Zone requires a determination that the level of PPE being worn affords adequate protection.

In addition to providing patient care in the Support Zone, qualified EMS personnel may be asked to assume any of the following roles: Safety Officer, EMS Section Officer (e.g., Triage, Treatment, Transportation, Communications), Rehabilitation Officer, or Public Information Officer. EMS personnel also frequently provide medical surveillance for the hazmat team.

Assessment, Decontamination, and Initial Treatment of Patients

The primary goals for emergency personnel in a hazardous materials incident include cessation of patient exposure, patient stabilization, removal of the patient from danger, containment of the hazard to prevent further contamination, and patient treatment all without jeopardizing their own safety. While not all chemicals pose a hazard for secondary contamination, until the risk is known, termination of exposure is best accomplished by removing the patient from the incident area and then decontaminating the patient. If the victim is removed from the possibility of additional exposure or other dangers and is no longer considered contaminated, the level of required PPE for emergency personnel can be downgraded to a level that will better facilitate patient care. The potential for injury to the patient or to response personnel prohibits any treatment other than basic life support inside the Exclusion Zone. The dangers of hazardous substances, fire, or explosion, as well as the mobility restrictions inherent in PPE, outweigh the benefits of time saved by patient care in the Hot Zone.

The essential requirements for any decontamination task are:

- A safe area to keep a patient while undergoing decontamination
- A method for washing contaminants off a patient
- A means of containing the rinsate
- Adequate protection for personnel treating the patient
- Disposable or cleanable medical equipment to treat the patient

Gross Patient Decontamination

Primary assessment can be undertaken while simultaneously performing gross decontamination in the outer edge of the Exclusion Zone or in the Contamination Reduction Zone. **Priority should be given to the fundamentals of emergency treatment airway, breathing, and circulation (ABCs).** Once life-threatening matters have been addressed, rescue personnel can direct their attention to more thorough decontamination and secondary patient assessment. Appropriate personal protective equipment and clothing must be worn until the threat of secondary exposure no longer exists. The sooner the patient is decontaminated, the sooner he or she can be transferred to the Support Zone for further evaluation and treatment.

If there is a risk of secondary contamination, gross decontamination should be performed simultaneously with initial patient stabilization. This consists of cutting away or otherwise removing all potentially contaminated clothing, including jewelry and watches. All removed items should be doubled-bagged in plastic bags, sealed, and labeled. Any obvious contamination should be brushed or wiped off, followed by a 1-minute-long rinsing from head to toe with tepid water. If the suspected chemical is water-reactive, a longer rinsing period and a greater volume of water is required. Care should be taken to protect any open wounds from contamination by covering them with a water-repellent dressing (e.g., Chux). Throughout these procedures, every effort should be made by emergency personnel to avoid contact with any potentially hazardous substance(s).

Secondary or Definitive Decontamination

Effective decontamination consists of making the patient As Clean As Possible (ACAP). If conditions permit (appropriate personnel, supplies, water, weather), a more deliberate decontamination process known as secondary or definitive decontamination should be initiated on each patient before transfer into the Support Zone. This process includes washing the individual, usually with soap and water, in an organized and thorough manner. Initiating this step implies that contamination has been reduced to a level that is no longer a threat to the patient or to the responder. Determining the adequacy of decontamination can be very difficult, however, and is often based on a best clinical judgment rather than on objective data. Detection monitors (to indicate how clean an area is) have limited value and are not generally available to most fire departments or EMS agencies. When a patient cannot be definitively decontaminated, then he or she should be loosely wrapped in a cocoon-like fashion with a blanket or sheet prior to transfer to the Support Zone.

Exhibit III-2 outlines the minimum equipment that is required for patient decontamination by emergency response personnel. These lists are not comprehensive, and are provided to guide departments in developing their own equipment lists based on community needs and requirements.

With few exceptions, intact skin is more resistant to hazardous materials than injured flesh, mucous membranes, or eyes. Therefore, secondary decontamination should begin at the head and proceed downward, with initial attention paid to contaminated eyes and open wounds. Once wounds have been cleaned, care should be exercised not to recontaminate them. This can be aided by covering the wounds with a waterproof dressing. For some chemicals, such as strong alkaline substances, it may be necessary to flush exposed skin and eyes with water or normal saline for a minimum of 15 minutes.

Exhibit III-2
Suggested Decontamination Equipment

The equipment and supplies listed are the minimum necessary to undertake decontamination procedures. In addition, PPE used by decontamination personnel should be no less than one level below that used for entry into the hazardous environment. Positive-pressure self-contained breathing apparatus (SCBA) and fully-encapsulated suits may be necessary in extreme cases.

- Containment equipment
  - Pool or tank
  - Tarps
  - 6-mil construction plastic
- Fiberglass backboards
- Supports for ambulatory patients
- Sawhorses to support backboards
- Water supply
- Scissors for clothing removal
- Mild detergent (dishwashing liquid)
- Five-gallon buckets
- Sponges and soft brushes
- Towels and blankets
- Disposable clothes and shoes for ambulatory patients
- Large plastic bags for contaminated clothing with predetermined unique ID tags to go on the bag and patient wrist/neck
- Small plastic bags for patients valuables (clear freezer bags are preferable)
- Tags and waterproof pens to mark bags
- Clear, zip-front body suits or large water repellant blankets to minimize contamination to transport personnel and ambulances
- Tape (duct, 4-inch)
- Triage tags

Washing should be done using warm water, soft bristle brushes or sponges, and a mild soap, such as dishwashing liquid. Hot water, stiff brushes, and vigorous scrubbing should seldom be used because they cause vasodilation, abrasion, and increased entry of toxicants through the skin. The skin of young children is particularly sensitive and should be treated accordingly. Responders should try to contain all run-off from decontamination procedures for proper disposal. Whenever possible, men and women should be provided separate treatment areas. Allowing ambulatory patients to decontaminate themselves under supervision may accelerate the process and reduce the need for response personnel. In such cases, it may be necessary to provide instructions in multiple languages, preferably using a prerecorded message, to assure that patients understand the problem and follow instructions. Patient compliance with clothing removal and decontamination instructions will likely be influenced by their perception of the threat to their life and health, as well as by the clarity and authoritative nature of the instructions given.

Decontamination of nonambulatory patients is more difficult and labor-intensive. Careful attention must be paid to cleaning the back, buttocks, axilla, hair, and genitalia. The backboard and collar

along with any other medical equipment used to transport the patient must either be decontaminated or exchanged prior to the individual entering the Support Zone. If a patient is seriously ill, ventilation support and the administration of medicines may be required while he or she is undergoing decontamination. However, invasive procedures (e.g., intubation) should not be initiated in the Contamination Reduction Zone unless absolutely necessary.

All potentially contaminated patient clothing and belongings that have been removed and bagged should remain in the decontamination area. They should not be transported with the patient in the ambulance unless approved by the Decontamination Officer or Safety Officer.

Many chemical substances, even though highly toxic, carry no intrinsic risk for contamination to others. Most toxic gases, such as carbon monoxide or arsine, are highly poisonous, but once the victim has been brought out of the exposure area and into the fresh air, the amount of leftover gas in and around the patient is unlikely to poison others, especially when the patient s clothes are removed. Even many chemicals that have the potential for spreading contamination can be rendered less hazardous by clothing removal and simple dilution of contaminants with copious amounts of water.

Pediatric Decontamination Considerations

The complexity of managing a hazardous materials incident is increased when children are involved. While protective to the wearer, PPE may be frightening to a young child, resulting in less cooperation and greater psychological trauma. Whenever possible, children and parents (or other adults known to them) should remain together while undergoing decontamination, medical treatment, and transport to the hospital. Constant reassurance and compassion will be especially important if a child is separated from his or her parent(s). Efforts at reuniting parent and child should be made as early as is safely possible, either at the scene or at the hospital. Older children, while likely to be more compliant with instructions and self-sufficient during the decontamination process, may nevertheless be more susceptible to mass hysteria if not properly informed and reassured.

Increased susceptibility to hypothermia is an important consideration in determining to what degree a child is decontaminated in the field as opposed to being grossly decontaminated, wrapped in a blanket for transport, and then given definitive decontamination at the hospital or other heated location.

Mass Population Decontamination

Certain hazmat incidents result in large numbers of patients being exposed (or believing they were exposed) to a chemical agent. In this situation, responding personnel will find it necessary to implement proper triage to prioritize patients entry through the decontamination process, or to quickly expand the decontamination system to clean more patients simultaneously. Gaining quick control of the escaping crowd and initiating immediate decontamination procedures (if indicated) is essential to minimize secondary contamination, morbidity, mortality and panic. Large volumes of water from charged hose lines, and specially-mounted nozzles or deluge guns on fire engines, can be used to quickly rinse large numbers of individuals. Some fire departments or hazmat teams use portable trailers and/or aerial ladder trucks with special spray systems containing both soap and water (or bleach and water) to provide gross and/or secondary decontamination for large-scale efforts. Once through the decontamination steps, patients should be given towels, temporary clothing (e.g., a plain

Decontamination

- Make sure all clothing is removed.
- Brush or vacuum particulate matter off of skin.
- Decontaminate systematically from the head down with water:
  - Water-wash contaminated area gently under a stream of water, and scrub with a soft brush or surgical sponge along with soap
  - Limit mechanical or chemical irritation of the skin by overzealous scrubbing or forceful water flow
  - Use warm, never hot, water
  - Decontaminate exposed wounds and eyes before intact skin areas
  - Cover wounds with a waterproof dressing after decontamination
  - Take care not to introduce contaminants into open wounds
  - Remember the back, under skin folds and genitalia
  - Watch for any changes in the patient s condition
- Remove contaminants to the level that they are no longer a threat to the patient or response personnel, or as far as the situation or their clinical condition allows.
- Isolate the patient from the environment by wrapping in blanket/sheet to prevent the spread of any remaining contaminants.
- If possible, contain all runoff from decontamination procedures for proper disposal.
- Ensure that all potentially contaminated patient clothing and belongings have been bagged and tagged:
  - Properly label the bags that contain clothing or other potentially contaminated articles
  - Consult with proper officials (e.g., Safety Officer, Hazmat Officer) regarding disposition of bags containing patient valuables

Tyvek suit with hood, booties, and gloves), and a blanket, and then directed to the Treatment Sector for evaluation. Mass decontamination planning should also address issues such as non-English-speaking patients, caring for physically impaired patients (e.g., nonambulatory, blind, wheelchair-bound), and large numbers of worried but well victims.

Considerations for Patient Treatment

In most aspects, a contaminated patient is like any other patient except that responders must protect themselves and others from dangers due to secondary contamination. Response personnel must first address life-threatening issues and gross decontamination before taking supportive measures. If spinal immobilization appears necessary, it should be initiated as soon as feasible. Primary surveys should be accomplished simultaneously with decontamination, and secondary surveys completed as conditions allow. In treating patients, personnel should consider the chemical-specific information received from the Poison Control Center and other information resources. In multiple patient situations, proper triage procedures should be implemented using local emergency response plans (see Section I SARA Title III).

Patient Treatment

- Assign highest priorities to ABCs and decontamination.
- Complete primary and secondary surveys as conditions allow. Bear in mind the chemical-specific information received from the designated poison control or medical control center.
- Treat for spinal injury, if indicated.
- In multiple patient situations, begin proper triage procedures.
- Administer antidotes and dosages per local protocol.
- Delay prophylactic measures until the patient is decontaminated.
- Perform invasive procedures only in uncontaminated areas.
- Reassess the patient frequently because many chemicals have latent physiological effects.

The patient should undergo frequent reassessments because many hazardous materials have latent physiological effects. Unless required by life-threatening conditions, prophylactic invasive procedures, such as intravenous injections or intubation, should be performed only in fully decontaminated areas and where conditions permit because they may create a direct route for introducing hazardous material(s) into the patient. Oxygen should be given using a bag valve mask with reservoir device (rebreather) or with a manually triggered oxygen-powered breathing device. Oxygen bottles and regulators should be encapsulated in plastic to facilitate decontamination, and every effort should be made to avoid mixing contaminated air with the oxygen. Caution must also be exercised when dealing with patients who are vomiting; off-gassing of a product or absorption through the skin or mucous membranes can occur from the emesis in some cases.

While some contaminated patients may require treatment with antidotes, most cases can be handled with symptomatic care. Antidote administration should be based on patient condition, antidote availability, and proximity to the hospital. Emergency personnel must have a thorough understanding and familiarity with authorized antidotes since they can have significant side effects. Medication dosing for children must be carefully checked because they are most often administered on a mg/kg basis, and therapeutic and toxic levels can be very close. Exhibit III-3 lists frequently used antidotes and selected other pharmacologic treatment agents.

Exhibit III-3
Antidotes and Select Pharmacologic Treatment Agents

Antidote	Toxicant
Atropine[1]	Organophosphate pesticides and nerve agents
Pralidoxime chloride (2-PAM Chloride)[1]	Organophosphate pesticides and nerve agents
Cyanide antidote kit	Cyanide
Methylene blue 1%	Methemoglobinema
Activated charcoal	Certain ingested substances
Calcium gluconate (Gel and IV)	Hydrofluoric acid and fluoride toxicity
Oxygen	Carbon monoxide

[1] Can be found combined in auto-injection kit known as Mark I.

Patient Transport to the Hospital

When transporting a contaminated patient (i.e., only gross decontamination performed) by ambulance, special care should be exercised to prevent contamination of the vehicle and subsequent patients. Exposed surfaces that the patient is likely to contact should be protected by disposable sheeting. The use of both chemically resistant backboards and disposable sheeting are highly recommended. If a wooden backboard is used, it should be wrapped in a disposable cover or it may have to be discarded. Unnecessary equipment should be stored in a safe location or removed; equipment that does come in contact with the patient should be segregated for decontamination or disposal.

Exhibit III-4 outlines suggested equipment for the care and transport of contaminated patients. Items should be added or deleted based on local needs and experience.

The patient should be as clean as reasonably possible before transport, and further contact with contaminants should be avoided. **No patient should be transported who has not, at a minimum, undergone gross decontamination.** Protective clothing should be worn by response personnel, as appropriate. If secondary decontamination cannot be performed prior to transport, responders should attempt to prevent the spread of contamination by wrapping the patient loosely but completely in a large blanket or sheet. Body bags are not recommended for encapsulating patients for physiological and mental health reasons. Consideration should also be given to chemicals that present the added danger of accelerated skin absorption due to heat. The name(s) of the involved chemicals, if identified, and any other data available, should be recorded before leaving the scene. Oxygen should be administered by rebreather mask for any victim with respiratory problems unless contraindicated (e.g., end-stage chronic obstructive pulmonary disease (COPD)). Eyes that have been exposed should be irrigated with available saline or water, and irrigation should be continued en route to the hospital. Personnel should also be alert for any signs of respiratory distress, cardiovascular collapse, or gastrointestinal complaints. Seizures may occur and should be treated according to local protocol. Patients experiencing pain as a result of their injuries should be treated per medical control or agency protocol. Various types and degrees of burns may be seen and should be treated per local burn protocol or Burn Center instructions. In the case of acid and alkaline burns to the eyes, they should be continuously irrigated en route to the hospital. Control and proper disposal of the run-off is necessary to avoid injury to the patient and prehospital caregiver(s). Verbal reassurances and other forms of psychological support will also be important to minimize further fear and anxiety.

During transport, ambulance personnel should use appropriate respiratory protection. Provide the maximum fresh air ventilation (e.g., open windows) that weather conditions permit to the patient s and driver s compartments, regardless of the presence or absence of odors.

Contact the receiving hospital and provide an update on treatment provided or required and any other pertinent clinical information. Instructions for the procedure to enter the hospital with a contaminated patient should also be requested. Facilities receiving a potential hazardous materials patient will need as much information as possible, as soon as possible.

Exhibit III-4
Supplies Needed to Prepare the Ambulance for Care of a Patient Contaminated with Hazardous Materials

- Sufficient 6-mil construction plastic[1] cut to size to:
  - Cover floor of ambulance
  - Cover squad seat
  - Cover litter
- Disposable sheet(s)
- Plastic trash bags to contain contaminated medical supply waste, gloves and the victim s clothes, and vomitus
- Personal Protection:
  - CPC disposable suits with built-in hoods and booty/boot covers
  - Positive-pressure SCBA[2]
  - Full-facemask respirator with an orange- and purple-type cartridge (acid gas, organic vapor, highly toxic dust, mist and fumes, and radionuclides-rated, HEPA cartridge)[2]
  - Polyvinyl chloride (PVC) or duct tape for taping closures
  - Two-piece rainwear
  - Rubber boots with steel toes
  - Nitrile gloves with 14-inch cuffs
  - Duct tape to seal suit seams, if necessary

[1] Wet plastic is slippery; stability is important.

[2] Must not be used without prior training and fit testing.

NOTE: The protective equipment listed is to be used for patient care situations after initial decontamination. It is meant to be used when complete decontamination of the patients cannot be guaranteed or when assisting with decontamination procedures (in extreme cases positive-pressure SCBA and encapsulated suites may be required for decontamination procedures). **It is not meant to be used in rescue operations of victims found in a hazardous area.** Under no circumstances should this equipment be relied upon for entry into hazardous environments. Protective equipment for entry must be appropriate to and compatible with the products involved. This may include positive-pressure SCBA and fully encapsulated suits. Many factors must be taken into consideration when determining the appropriate level of protection. Consequently, selection of protective equipment must be done by a qualified individual.

A radio report checklist should be developed and made available for all vehicles and telephone or radio communication centers. This information will aid in initiating appropriate actions:

- Type and nature of incident
- Number and ages of patients
- Signs and symptoms being experienced by the patients
- Nature of injuries
- Name of chemical(s) involved, including trade names
- Information available at the site concerning the chemical(s), including the MSDSs
- Extent of patient decontamination in the field
- Estimated time of arrival

The ambulance should park in an area away from the emergency room or go directly to a predesignated decontamination location, thereby limiting exposure to hospital facilities. To protect hospital staff and other patients, the victim should not be brought into the emergency department before ambulance personnel receive permission from the hospital staff.

Upon release of the patient to the hospital, any nondisposable equipment that is believed to be contaminated should be double-bagged. Contaminated articles should be kept sealed until the Incident Commander or his designee gives further instructions. Whenever possible, the use of disposable equipment is recommended. Inquiries should be made at the hospital to determine where the ambulance can be safely decontaminated, and whether equipment is available for this purpose. The method of decontamination should be based on the chemical(s) involved and the extent of patient decontamination prior to transport. In most cases soap and water are adequate for vehicle decontamination. The ambulance should not go back into service until it is determined to be safe by an appropriately trained individual (e.g., a hazmat team coordinator). This again emphasizes the benefits of thorough patient decontamination prior to transport; if the patient is clean, then the vehicle s interior will also be clean.

Transport to the Hospital

- Get patient as clean as possible prior to transport.
- Avoid contact with contaminants; provide protection to the vehicle; wear protective clothing as appropriate.
- Provide other patient care according to condition and local protocol.
- Before leaving the scene, write down the name of the involved chemical(s) and any other available data.
- Provide fresh air ventilation to the patient s and the driver s compartments.
- Contact the receiving hospital ASAP; provide information on the patient and treatment rendered; identify the chemical, its toxicology, MSDS, and any other pertinent information.
- Obtain instructions on approaching and entering the hospital.
- Have open bag ready in case of vomiting and carefully isolate vomitus since off-gassing can occur.
- Be alert for any respiratory distress; administer oxygen by mask for any patient with respiratory problems (except as contraindicated).
- Continue to irrigate eyes as needed with normal saline or water.
- Park the ambulance in a location away from the emergency department or go directly to a predesignated decontamination area.
- Do not bring patients into the emergency department before receiving permission from the hospital staff.
- After unloading the patient, check with the hospital to determine where the ambulance can be safely decontaminated, and the availability of equipment for this purpose.
- Decontaminate exposed emergency personnel.

Air Transportation of Chemically Exposed Patients

The role of aeromedical support for hazmat incidents is limited because of the potential danger in transporting patients by helicopter from a hazardous materials site. Especially in cases involving more severe injuries, decontamination is often incomplete before removal, and as a result the flight crew risks becoming seriously ill in transit. The flight path to the site may also require their traveling through an unsafe area. Furthermore, the down draft from the helicopter can affect vapor or fume dispersion at the scene. In many areas, flight program policies specifically preclude the use of helicopters for these types of incidents.

Critique

As soon as possible following a hazardous materials incident, all participating units should send knowledgeable representatives to meet and review the measures that were taken by each unit or agency. The purpose of this review is to examine which activities succeeded and which did not, and to evaluate the overall coordination effort with an aim toward making necessary improvements. The results of the discussion should be shared with all agency personnel. Identified weaknesses or omissions in the response plan should be corrected, and training given on new policies and procedures.

Patient Management Under Mass Casualty Conditions Involving Hazardous Chemicals

Basic medical procedures in a large-scale hazardous materials incident are not substantially different from life-saving measures in other mass casualty disasters. Primary attention should focus on the ABC fundamentals of emergency care, with decontamination performed at the same time.

There are, however, several important differences in disasters involving hazardous materials. A hazmat disaster may require setting up mass screening and decontamination centers. It may also be necessary to establish casualty collection points to provide stabilizing care in the field prior to transport. A major chemical incident may overwhelm any one hospital, especially if it occurs along with another disaster such as an earthquake. Such an event would drastically increase the number of casualties and the complexity of the medical care that must be provided (e.g., crushing injuries or spinal trauma, combined with gas inhalation). This would require increased numbers of personnel, perhaps more sophisticated medical equipment, and a better transport system for taking stabilized victims out of the area. Training in the appropriate procedures to be followed is essential for potential responders to a hazardous materials incident involving mass casualties. Triage may also be complicated for chemical exposures associated with the delayed onset of signs and symptoms. If necessary, the patient, injured or not, must be decontaminated before being transported to the emergency department to protect EMS and emergency department staff.

Critical Incident Stress Management

Situations involving large numbers of ill or injured individuals, and risks of harm to the responder(s), are sources of critical incident stress. To minimize the occurrence of acute or long- term psychological consequences in response personnel, stress debriefing sessions should be held shortly after the incident. Acute stress reactions recognized during and after the incident should be immediately addressed by qualified peer debriefers or other mental health professionals.

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