TRANSPORTATION OF THE INJURED

LEARNING OBJECTIVES:

Describe the different forms of emergency transportation.

Identify essential BLS equipment and supplies on Navy ambulances.

Thus far this chapter has dealt with emergency methods used to move an injured person out of danger and into a location to facilitate first aid being administered.

Casualties should not be moved before the type and extent of injuries are evaluated and the required emergency medical treatment is given. The exception to this occurs when the situation dictates, i.e., a fire. The situation will dictate the urgency of casualty movement.

Emergency Vehicles

In most peacetime emergency situations, some form of ambulance will be available to transport the casualty to a treatment facility.
There are many differences in design and storage capacity and most ambulances are equipped to meet the same basic emergency requirements. They contain equipment and supplies for emergency airway care, artificial ventilation, suction, oxygenation, hemorrhage control, fracture immobilization, shock control, blood pressure monitoring, and poisoning. They also contain litters, spineboards, and other extrication equipment.

Deployed units at sea, in the field, and at certain commands near air stations will also have access to helicopter MEDEVAC support (Fig. 20-39). Helicopters are ideal for use in isolated areas but are of limited practical use at night, in adverse weather, under certain tactical conditions, or in developed areas where buildings and power lines interfere. In addition to taking these factors into consideration, the HM must decide if the casualty’s condition is serious enough to justify a call for a helicopter. Some injuries require very smooth transportation or are affected by pressure changes that occur in flight. The final decision will be made by the unit commander, responsible for requesting the helicopter support.

1. AIRCRAFT DESIGNED FOR MEDEVAC:

a. UH-1V: Crew of 2 pilots, 1 crew chief and 1 medic. Standard configuration is 3 litters and 4 ambulatory. The maximum configuration is 6 litters or 9 ambulatory. Red Cross Markings 4: one on the nose, the belly, and each cargo door.

b. UH-60A: Same crew as the UH-1V. Standard configuration is 4 litters and 1 ambulatory. The maximum configuration is 6 litters and 1 ambulatory or 7 ambulatory or some configuration thereof. Red Cross Markings 5: one on the nose, belly, one on each cargo door, and one on top.

c. CH-47: Crew of 2 pilots, 2 crew chiefs and 1 medic for every 6 litter patients. The standard configuration is 16 ambulatory and 12 litters. The maximum configuration is 31 ambulatory or 1 ambulatory and 24 litters. This aircraft has no Red Cross markings. The primary mission of this aircraft is mass casualty evacuation. Various configurations are noted below.

<table>
<thead>
<tr>
<th>AMBULATORY</th>
<th>LITTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>0</td>
</tr>
<tr>
<td>25</td>
<td>4</td>
</tr>
<tr>
<td>19</td>
<td>8</td>
</tr>
<tr>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>1</td>
<td>24</td>
</tr>
</tbody>
</table>

NOTE:
The capacity of all aircraft may be reduced because of temperature, humidity or age of the aircraft. Any aircraft may be used for CASEVAC.

Figure 20-39.—Loading a patient onto a helicopter for MEDEVAC

Image provided by: Department of the Army. (2009). Soldier’s handbook and training guide for MOS 68W STP 8-68W13-SM-TG.
Preparing the Patient for Transport

Once emergency medical care has been completed on-scene, the patient must be transferred to the treatment facility. A process known as packaging provides the means of properly positioning, covering, and securing the patient to avoid any unnecessary aggravation to the patient’s condition. Covering helps maintain the patient’s body temperature, prevents exposure to the elements, and provides privacy. Do not "package" a badly traumatized patient; it is more important to transport the critical or unstable patient to the treatment facility quickly. The most important aspect of each rescue or transfer is to complete it as safely and efficiently as possible.

Care of Patient en Route

The emergency care a HM can offer patients en route is limited only by the availability of supplies, the level of external noise and vibrations, and the competency and ingenuity the HM possesses. There are three phases to en route care in the military operational environment. The degree to which they affect the scenarios varies by situation; they are relevant to some degree in the operational and non-operational environments. The phases are:

- **Care Under Fire**

  The Care Under Fire (CUF) defines the care to be provided while there is a direct and ongoing threat to the patient and HM. CUF is aid which can be rendered very quickly to address an immediate life threat. This is commonly viewed as the placement of a tourniquet on a bleeding extremity, moving the wounded out of the line of fire if able, and little more.

- **Tactical Field Care**

  The Tactical Field Care (TFC) phase is that point in time when the threat is reduced or resolved but the patient is still in a tactically unstable environment. Perhaps the direct fire has temporarily stopped, or the Corpsman and his or her patient have found some cover where the HM can focus safely on patient rather than achieving fire superiority.

  During this phase the HM can perform an initial patient evaluation assessing for H-A-B-C (life-threatening Hemorrhage, Airway, Breathing, and Circulation). The HM can re-check that tourniquet applied earlier, dress wounds, perform a needle thoracotomy or start IVs as needed, and employ other emergency measures. It is important to remember that the TFC phase can be dynamic and the threat may quickly return, so dedicated efforts such as CPR are not initiated.

- **Tactical Evacuation Care**

  The Tactical Evacuation Care phase (TACEVAC), formerly called the Casualty Evacuation (CASEVAC) stage, will consist of medical treatment rendered during movement to the appropriate treatment facility. This care may range from continued treatment provided by the first responder during a hasty evacuation to a safe zone, to advanced medicine performed by dedicated medical crews en route to a trauma center. Movement of the patient away from the threat zone and toward definitive medical care is the defining feature of this phase.

  The principles of Tactical Combat Casualty Care have been constantly refined and have been in widespread use among military and civilian tactical teams for over a decade, with a track record of saving lives. Further incorporation of these guidelines and practices into teams not yet using them will help ensure the safety, health, and survivability of its members. In this particular section the HM will focus on the steps of preparing for the TACEVAC outside of patient care procedures.

**REQUEST MEDICAL EVACUATION**

Once the H1M has a casualty requiring medical evacuation (MEDEVAC) a medical evacuation will be requested. The HM will need a patient pickup site, operational communications equipment, MEDEVAC request format, and unit signal operation instructions (SOI).
Transmit a MEDEVAC request. At a minimum, transmit line numbers 1 through 5 during the initial contact with the evacuation unit. Transmit lines 5 through 9 while the aircraft or vehicle is en route, if not included during the initial contact.

**STEPS**

1. Collect all applicable information needed for the MEDEVAC request, i.e., 9-Line.
   a. Determine the grid coordinates for the pickup site.
   b. Obtain radio frequency, call sign, and suffix.
   c. Obtain the number of patients and precedence.
   d. Determine the type of special equipment required.
   e. Determine the number and type (litter or ambulatory) of patients.
   f. Determine the security of the pickup site.
   g. Determine how the pickup site will be marked.
   h. Determine patient nationality and status.
   i. Obtain pickup site chemical, biological, radiological, and nuclear (CBRN) contamination information normally obtained from the senior person in charge of the site or medic.

### NOTE:
CBRN line 9 information is only included when contamination exists.

2. Record the gathered MEDEVAC information using the authorized brevity codes (Table 20-1).

### NOTE:
Unless the MEDEVAC information is transmitted over secure communication systems, it must be encrypted.

3. Transmit the MEDEVAC request.
   a. Contact the unit that controls the evacuation assets.
   b. Make proper contact with the intended receiver.
   c. Use effective call sign and frequency assignments from the SOI.
   d. Give the following in the clear "I HAVE A MEDEVAC REQUEST:" wait one to three seconds for a response. If no response, repeat the statement.
   e. Transmit the MEDEVAC information in the proper sequence.
      a. State all line item numbers in clear text. The call sign and suffix (if needed) in line 2 may be transmitted in the clear.
### MEDEVAC Request Form

<table>
<thead>
<tr>
<th>LINE</th>
<th>ITEM</th>
<th>EXPLANATION</th>
<th>WHERE/HOW OBTAINED</th>
<th>WHO NORMALLY PROVIDES</th>
<th>REASON</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Location of the pick-up site</td>
<td>Encrypt the grid coordinates of the pickup site. When using the DRYAD Numerical Cipher, the same “SET” line will be used to encrypt the grid zone letters and the coordinates. To preclude misunderstanding, a statement is made that grid zone letters are included in the message (unless unit SOP specifies its use at all times).</td>
<td>From map</td>
<td>Unit leader(s)</td>
<td>Required so evacuation vehicle knows where to pick up patient. Also, so that the unit coordinating the evacuation mission can plan the route for the evacuation vehicle (if the evacuation vehicle must pick up from more than one location).</td>
</tr>
<tr>
<td>2</td>
<td>Radio frequency, call sign, and suffix</td>
<td>Encrypt the frequency of the radio at the pickup site, not a relay frequency. The call sign (and suffix if used) of person to be contacted at the pickup site may be transmitted in the clear.</td>
<td>signal operation instructions</td>
<td>ROI</td>
<td>Required so that evacuation vehicle can contact requesting unit while en route (obtain additional information or change in situation or directions)</td>
</tr>
<tr>
<td>3</td>
<td>Number of patients by precedence:</td>
<td>Report only applicable information and encrypt the brevity codes.</td>
<td>From evaluation of patient(s)</td>
<td>Corpsman or senior person present</td>
<td>Required by unit controlling vehicles to assist in prioritizing missions.</td>
</tr>
<tr>
<td></td>
<td>A - Urgent</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B - Urgent Surgical</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C - Priority</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D - Routine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>E - Convenience</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Special equipment required:</td>
<td>Encrypt the applicable brevity codes.</td>
<td>From evaluation of patient/situation</td>
<td>Corpsman or senior person present</td>
<td>Required so that the equipment can be placed on board the evacuation vehicle prior to the start of the mission.</td>
</tr>
<tr>
<td></td>
<td>A - None</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B - Hoist</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C - Extraction equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D - Ventilator</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Number of patients:</td>
<td>Report only applicable information and encrypt the brevity code. If requesting medical evacuation for both types, insert the word “BREAK” between the litter entry and ambulatory entry.</td>
<td>From evaluation of patient(s)</td>
<td>Corpsman or senior person present</td>
<td>Required so that the appropriate number of evacuation vehicles may be dispatched to the pickup site. They should be configured to carry the patients requiring evacuation</td>
</tr>
<tr>
<td></td>
<td>A - Litter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B - Ambulatory</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>L + # of patients - Litter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A + # of patients - Ambulatory (sitting)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 20-1.—MEDEVAC Request Form
<table>
<thead>
<tr>
<th>LINE</th>
<th>ITEM</th>
<th>EXPLANATION</th>
<th>WHERE/HOW OBTAINED</th>
<th>WHO NORMALLY PROVIDES</th>
<th>REASON</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Number and type of wound, injury, or illness (Peacetime)</td>
<td>Specific information regarding patient wounds by type (gunshot or shrapnel). Report serious bleeding, along with patient’s blood type, if known.</td>
<td>From evaluation of patient(s)</td>
<td>Corpsman or senior person present</td>
<td>Required to assist evacuation personnel in determining treatment and special equipment needed.</td>
</tr>
<tr>
<td>6</td>
<td>Security at pick-up site</td>
<td></td>
<td>From evaluation of situation</td>
<td>Unit leader</td>
<td>Required to assist the evacuation crew in assessing the situation and determining if assistance is required. More definitive guidance can be furnished the evacuation vehicle while en route (specific location of enemy to assist an aircraft in planning its approach).</td>
</tr>
<tr>
<td>7</td>
<td>Method of marking pick-up site</td>
<td>A - Panels</td>
<td>Based on situation and availability of materials</td>
<td>Corpsman or senior person present</td>
<td>Required to assist the evacuation crew in identifying the specific location of the pickup. Note that the color of the panels or smoke should not be transmitted until the evacuation vehicle contacts the unit (just prior to its arrival). For security, the crew should identify the color and the unit verifies it.</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>B - Pyrotechnic signal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>C - Smoke signal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>D - None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>E - Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Patient nationality and status:</td>
<td>A - US Military</td>
<td>From evaluation of patient(s)</td>
<td>Corpsman or senior person present</td>
<td>Required to assist in planning for destination facilities and need for guards. Unit requesting support should ensure that there is an English speaking representative at the pickup site.</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>B - US Civilian</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>C - Non-US Military</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>D - Non-US Civilian</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>E - EFW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Terrain description (Peacetime)</td>
<td>Include details of terrain features in and around proposed landing site. If possible, describe relationship of site to prominent terrain feature (lake, mountain, tower).</td>
<td>Personnel present</td>
<td>From area survey</td>
<td>Required to allow evacuation personnel to assess route/avenue of approach into area. Of particular importance if hoist operation is required.</td>
</tr>
<tr>
<td>9</td>
<td>NBC Contamination:</td>
<td></td>
<td>From situation</td>
<td>Corpsman or senior person present</td>
<td>Required to assist in planning for the mission (determine which evacuation vehicle will accomplish the mission and when it will be accomplished).</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>N - Nuclear</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>C - Chemical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>* In peacetime - terrain description of pick-up site</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Establish a Helicopter landing site

The HM needs to establish a helicopter landing site. The HM will need smoke grenades, strobe lights, flashlights or vehicle lights, marker panels, and the equipment and personnel to clear the site if required.

Identify a landing site large enough for a helicopter to land and take off. Mark and identify all obstacles that cannot be removed and designate the touchdown site.

CAUTION:
Comply with unit SOP and or local environmental regulations concerning the cutting of live vegetation, digging holes, and or erosion prevention.

1. Select the landing site. The factors which should be considered are:

a. The size of the landing site.
   a. A helicopter requires a relatively level landing area, 30 meters in diameter. This does not mean that a loaded helicopter can land and take off from an area of that size. Most helicopters cannot go straight up or down when fully loaded. Therefore, a larger landing site and better approach and departure routes are required.
   b. When obstacles are in the approach or departure routes, a 10 to 1 ratio must be used to lay out the landing site. For example, during the approach and departure, if the helicopter must fly over trees that are 15 meters high, the landing site must be at least 150 meters long (10 x 15 = 150 meters).

b. The ground slope of the landing site.
   When selecting the landing site, the ground slope must be no more than 15 degrees. Helicopters cannot safely land on a slope of more than 15 degrees.

a. When the ground slope is less than 7 degrees, the helicopter should land up slope.

b. When the ground slope is 7 to 15 degrees, the helicopter must land side slope (Fig. 20-40).

Figure – 20-40 Slope Landing

c. Surface conditions.
   a. The ground must be firm enough that the helicopter will not bog down during loading or unloading. If firm ground cannot be found, the pilot must be told and required to hover at the landing site during the loading or unloading.
   b. Rotor wash on dusty, sandy, or snow-covered surfaces may cause loss of visual contact with the ground. Therefore, these areas should be avoided.
   c. Loose debris that can be kicked up by the rotor wash must be removed from the landing site. Loose debris can cause damage to the blades, engines and personnel in the area.

d. Obstacles.
   a. Landing sites should be free of tall trees, telephone lines, power lines or poles; similar obstructions on the approach or departure ends of the landing site must also be cleared.
   b. Ensure obstructions that cannot be removed (such as large rocks, stumps, or holes) were marked clearly within the landing site.

20-39
2. Establish security for the landing site. Landing sites should offer some security from enemy observation and direct fire. Good landing sites will allow the helicopter to land and depart without exposing it to unneeded risks. Security is normally established around the entire landing site.

3. Mark the landing site and touchdown point.
   a. When and how the landing site should be marked is based on the mission, capabilities, and situation of the unit concerned. Normally, the only mark or signals required are smoke (colored) and a signalman. VS-17 marker panels may be used to mark the landing site, but MUST NOT be used any closer than 50 feet to the touchdown point. In addition to identifying the landing site, smoke will give the pilot information on the wind direction and speed.
   b. At night, the landing site and touchdown point are marked by an inverted "Y" composed of four lights. Strobe lights, flashlights, or vehicle lights may also be used to mark the landing site.

GUIDE A HELICOPTER TO A LANDING POINT

How to guide the helicopter to a safe landing identified by MEDEVAC request, identifying the landing site to the pilot and controlling the landing using the correct arm-and-hand signals.

1. As the aircraft approaches, provide the pilot with tactical and security information. Provide information on the conditions that may affect the landing such as terrain, weather, landing site markings, and possible obstacles (Fig. 20-41).
   a. Confirm information or answer any questions the pilot may have pertaining to the landing site.
   b. Maintain communications with the pilot during the entire operation.

2. Identify the landing site and guide pilot in.
   a. Once the pilot is within the HM’s area, radio contact will be established with the unit for positive identification.
   b. The pilot will be oriented to the landing site by using the clock method (12 o’clock is always the direction of flight). The pilot will be provided with the corresponding time position of the HM’s location. For example: "The LZ is now at 3 o’clock to HM’s position."
   c. Mark or identify the landing site:
      a. Day—The only signals required are colored smoke and a signalman. VS-17 marker panels may be used to mark the landing site, but are NOT used any closer than 50 feet to the touchdown point. In addition to identifying the landing site, the smoke will give the pilot the wind direction and speed.
      b. Night—The landing site and touchdown point are marked by an inverted "Y" composed of four lights (Fig. 20-42).

Figure 20-41.—Helicopter on the ground

Image provided by: Department of the Army.

Figure 20-42.—Inverted "Y" Marker
3. Use arm-and-hand signals.
   
a. Figures 20-43 A-H provide common arm and hand signals used to guide aircraft.

Figure 20-43A.—Arm Guidance

Figure 20-43E.—“Move to Left” Signal

Figure 20-43H.—“Land” Signal

Figure 20-43G.—“Move Downward” Signal

Figure 20-43F.—“Move Upward” Signal
b. Signals at night are given by using lighted batons or flashlights. In the illustrations, the person is using a lighted wand. This is a flashlight with a plastic wand attached to the end and used when there is decreased visibility.

c. The speed of the arm movement indicates the desired speed of aircraft compliance with the signal.

**NOTE:**
The "hover" signal should be used to change from one arm-and-hand signal to another.

For example, the signal person desires to land an approaching helicopter and the signal "move ahead" has been given to pilot. The helicopter is now positioned directly over the desired landing area.

Before giving the pilot to the signal to move downward, the signal person should execute the "hover" signal. This gives the pilot time to change from the "move ahead" to the "move downward" signal.

4. Proper positioning when using arm-and-hand signals.

   a. The signaling person's position when directing a helicopter is to the right front of the aircraft in order to be seen by the pilot. The position for utility helicopters is 30 meters to the right front of the aircraft during day or night operations.
HAZARDOUS MATERIAL EXPOSURE

LEARNING OBJECTIVE:

Explain hazardous material personal safety guidelines and hazardous material information sources.

Hazardous materials are substances with the potential of harming people or the environment. They can be gaseous, liquid, or solid, and can include chemical or radioactive materials. (Radiological exposure is covered in depth in Chapter 23 of this manual). The most common substances involved in incidents of hazardous material (HAZMAT) exposure are volatile organic compounds, pesticides, ammonia, chlorine, petroleum products, and acids.

The HM's initial action at the scene of a hazardous materials incident must be to assess the situation as the safety of the HM, patient, and the public are of primary concern. The HM

<table>
<thead>
<tr>
<th>HAZMAT Type</th>
<th>Label Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosives</td>
<td>Solid Orange Color</td>
</tr>
<tr>
<td>Non-Flammable Gases</td>
<td>Solid Green Color</td>
</tr>
<tr>
<td>Flammable Liquids</td>
<td>Solid Red Color</td>
</tr>
<tr>
<td>Flammable Solids</td>
<td>White and Red Stripes</td>
</tr>
<tr>
<td>Oxidizers &amp; Peroxides</td>
<td>Solid Yellow Color</td>
</tr>
<tr>
<td>Poisons &amp; Biohazards</td>
<td>Solid White Color</td>
</tr>
<tr>
<td>Radioactive Materials</td>
<td>Hal' White / Half Yellow with black radiation Symbol</td>
</tr>
<tr>
<td>Corrosives</td>
<td>Hal' White / Half Black</td>
</tr>
<tr>
<td>Other</td>
<td>Usually White</td>
</tr>
</tbody>
</table>

(ERG series, published every four years), RSPAP5800.8, is a useful tool for first responders during the initial phase of a hazardous materials/dangerous goods incident. ERG series addresses labeling, identification, toxicity, safety/contamination zones, and decontamination procedures. It is available at http://www.phmsa.dot.gov/hazmat.

NOTE:

It is imperative that all personnel involved with hazmat incident response be familiar with this publication.

DETERMINING THE NATURE OF THE HAZARDOUS MATERIAL

When an incident involving the exposure of hazardous material occurs, it is important to any rescue operation to determine the nature of the substance(s) involved. All facilities that produce HAZMAT are required by law to prominently display this information, as is any vehicle transporting it. Any carton or box containing such material must also be properly labeled. The name of the substance may also be displayed, along with a required four-digit identification number (sometimes preceded by the letters UN or NA - United Nations-North America number. It is also known as the UN or DOT number).

The various kinds of hazardous materials have different labels to assist in the identification. These are diamond-shaped signs having specific colors to identify the type of HAZMAT involved. Table 20-2 provides a list of the Department of Transportation (DOT)-mandated classifications of hazardous materials.
The ERG series provides a list of hazardous materials and appropriate emergency response actions. It is a tool enabling first responders to quickly identify the specific or generic classification of the material(s) involved in the incident, and to protect themselves and the general public during the initial phase of the incident.

SAFETY GUIDELINES

The HM's first objective should be to try to read the labels and identification numbers FROM A DISTANCE. If necessary, use binoculars. DO NOT enter into the area unless absolutely certain that there has not been a hazardous spill. Relay any and all information available to the dispatch center where it can be used to identify the HAZMAT.

Once the HAZMAT has been identified, it can be classified as to the danger it presents (i.e., toxicity level). Based on this classification, the appropriate specialized equipment (known as personal protective equipment or PPE) can be determined to provide adequate protection level from secondary contamination to rescue personnel and healthcare providers.

Toxicity Levels

The National Fire Protection Association (NFPA) has developed a system to indicate the health, flammability, and reactivity hazards of chemicals. It is called the NFPA 704 Labeling System and is made up of symbols arranged in squares to comprise a diamond-shaped label (Fig. 5-7). Each of the four hazards is indicated by a different colored square:

- **Red** indicates the flammability

<table>
<thead>
<tr>
<th>Table 20-2 – Classification of HAZMAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• <strong>Yellow</strong> indicates the reactivity</td>
</tr>
<tr>
<td>• <strong>White</strong> indicates any special hazards</td>
</tr>
<tr>
<td>• <strong>Blue</strong> indicates health hazards</td>
</tr>
</tbody>
</table>

20-44
The health hazard levels are
- **4** - deadly
- **3** - extreme danger
- **2** - hazardous
- **1** - slightly hazardous
- **0** - normal material

**Protection Levels**

The protection levels A, B, C, and D indicate the type and amount of protective equipment required in a given hazardous circumstance. Level A provides the greatest amount of protection and is used for the most hazardous incident(s).

- **Level A** - positive pressure-demand, full-face piece self-contained breathing apparatus (SCBA) or positive pressure-demand supplied air respirator with escape SCBA; fully encapsulating, chemical-resistant suit; inner chemical-resistant gloves; chemical-resistant safety boots/shoes; and two-way radio communication.

- **Level B** - positive pressure-demand, full-face piece SCBA or positive pressure-demand supplied air respirator with escape SCBA; chemical-resistant clothing (overalls and long-sleeved jacket with hooded one- or two-piece chemical splash suit or disposable chemical-resistant one-piece suit); chemical-resistant safety boots/shoes; hard hat; and two-way communication.

- **Level C** - full-face piece, air-purifying canister-equipped respirator; chemical-resistant clothing (overalls and long-sleeved jacket with hooded one- or two-piece chemical splash suit or disposable chemical-resistant one-piece suit); inner and outer chemical-resistant gloves; chemical-resistant safety boots/shoes; hard hat; and two-way communication.

- **Level D** - coveralls, safety boots/shoes, safety glasses or chemical splash goggles, and hard hat.

The HM is required to wear gloves at all four protection levels. If the correct type of glove to be used is not known, use neoprene or rubber, and avoid using latex or vinyl. In any instance, contact with HAZMAT should be avoided or minimized, and proper decontamination should be performed promptly. Protect feet from contact with HAZMAT by using a disposable boot/shoe cover made from appropriate material.

**Site Control**

For management purposes, site control is divided up into three sections.

- **Exclusion Zone (Hot Zone):** The area the contamination has occurred. The outer boundary of the exclusion zone should be marked either by lines, placards, hazard tape and/or signs, or enclosed by physical barriers. Access control points should be established at the periphery of the exclusion zone to regulate the flow of personnel and equipment. Remain **upwind** of the danger area and avoid low areas where toxic gases/vapors may settle.

- **Contamination-Reduction Zone (Warm Zone):** The transition area between the contaminated area and the clean area. This zone is designed to prevent the clean support zone from becoming contaminated or affected by other site hazards. Decontamination of personnel/equipment takes place in a designated area within the contamination-reduction zone called the "contamination-reduction corridor."

- **Support Zone:** The location of the administrative and other support functions needed to keep the operations in the exclusion and contamination-reduction zones running smoothly. The command post supervisor/incident commander should be present in the support zone. Personnel may wear normal work clothes within this zone.
RESCUE AND PATIENT CARE PROCEDURES

After a safety zone has been established and regardless of the HM's level of training the HM should follow the procedures outlined below:

- Help isolate the incident site and keep the area clear of unauthorized and unprotected personnel
- Establish and maintain communications with the dispatcher
- Stay upwind and uphill from the site
- Monitor wind and weather changes
- Do not breathe any smoke, vapors, or fumes
- Do not touch, walk, or drive through the spilled materials as this will increase the area of the spill
- Do not eat, drink, or smoke at the site
- Do not touch the face, nose, mouth, or eyes as these are all direct routes of entry into the body
- Eliminate any possible source of ignition (e.g., flares, flames, sparks, smoking, flashes, flashlights, engines, portable radios)
- Notify the dispatcher and give location
- Request the assistance of the HAZMAT response team
- If possible, identify the hazardous material and report it to the dispatcher
- Observe all safety precautions and directions given by the on-site HAZMAT expert. All orders should be given and received face to face
- Stay clear of restricted areas until the on-site HAZMAT expert declares them to be safe

Rescue from Exclusion Zone (Hot Zone)

The most dangerous element of any HAZMAT incident both to the exposed casualties and the rescuers is the rescue from the hot zone. Rescue operations should always be performed using appropriate protective equipment (PPE). Never enter the area unless properly trained to do so. Only the experts should handle this aspect of the rescue. Be prepared to provide supportive care once the casualty is clear of the contaminated area.

As soon as the casualty has been moved to safety, the HM should follow normal primary and secondary survey procedures, including interviews of the casualty and bystanders. Observe the casualty providing basic life support, supplemental oxygen, and monitoring vital signs.

Patient Decontamination Procedures

Decontamination is the process of removing or neutralizing and properly disposing of contaminants that have accumulated on personnel and equipment. Decontamination protects site personnel by minimizing the transfer of contaminants, helps to prevent the mixing of incompatible chemicals, and protects the community by preventing uncontrolled transportation of contaminants from the site. All personnel, clothing, and equipment that leave the contamination area (exclusion zone) must be decontaminated to remove any harmful chemicals that may have adhered to them. Some decontamination methods include those listed below.

- Dilution: the flushing of the contaminated person or equipment with water. It is the most frequently appropriate method of decontamination
- Absorption: the use of special filters and chemicals to absorb the hazardous material
- Chemical washes: specific chemicals used to neutralize the hazardous material
- Disposal and isolation: the proper disposal of contaminated materials instead of attempting to decontaminate them
Decontamination requires the use of PPE, although the level of protection required may be less once the casualty is out of the hot zone. A casualty who is exposed to a gas may not require actual “decontamination” after rescue and only require cessation of exposure and an opportunity to breathe fresh air. However, if a casualty is soaked with a liquid, the HAZMAT may pose an ongoing risk to the casualty and to the rescuers or medical personnel.

NOTE:

It is important to always assume that the casualty has been contaminated with something that could harm the HM and others until determined otherwise.

Once the casualty is medically evaluated, carefully remove any solid material that remains on the patient's clothing. If the material is dry, immediately remove the casualty's clothing while avoiding or minimizing contact with the HAZMAT or loss of the HAZMAT from the clothing. Unless specifically contraindicated by the hazardous nature of the HAZMAT and directed by the incident commander or the supporting medical advisor, flush the patient's skin, clothing, and eyes with water. To the maximum extent possible, control or retain the runoff (which is contaminated) which will be containerized for proper disposal. Remove all of the casualty's clothing, shoes, and jewelry. Place everything that may have contacted the HAZMAT in a special container. Mark the container as contaminated. Continue flushing the skin with water for at least 20 minutes trying to retain the runoff. Using available items, towels or clean rags, mechanically remove the HAZMAT by wiping; avoid rubbing the skin too vigorously. Dry the skin and provide uncontaminated dry clothing or coverings.

The nature of the HAZMAT involved and the threat to the health of others (rescue team, other casualties, medical personnel, and transport crew) determines the degree of decontamination necessary before treatment or transporting the casualty. It is preferred that decontamination be accomplished before treatment or transport. However, the patient's immediate medical condition may be more serious than the contamination itself. For example, ingested HAZMAT may pose little immediate threat to nearby personnel, but be an imminent threat to the casualty's life. Therefore, the consequences of delaying the emergency care of the patient's injuries to accomplish gut decontamination must be carefully evaluated. In some cases, decontamination and emergency medical care can be carried out simultaneously. In some instances, the casualty may require transportation to the treatment facility before decontamination. In these instances, notify both the treatment facility and transportation crew of the patient's medical condition and contamination. Depending on the situation, the transportation crew will have to prepare to carry and care for the contaminated casualty; otherwise, the crew themselves could be contaminated. For example, the transport crew may need to wear level A or B suits and/or respirators. If the casualty is contaminated and the transport requires personal protective devices, it is likely that the vehicle will be contaminated and requires appropriate decontamination. There is also a potential to contaminate the receiving treatment facility and its staff.
Diagnosis, Treatment, and Transport

As soon as the casualty has been removed from danger and moved to safety, follow primary and secondary survey procedures, including interviews of the casualty and bystanders. Observe the casualty and provide the ABCs of basic life support (airway, breathing, and circulation) add "D" and "E" for disability and exposure. Look for signs of trauma and provide proper exposure (i.e., remove clothing) to fully assess the casualty. As a guideline, give the patient supplemental oxygen (4 to 6 liters per minute), start an IV at an area of skin not exposed to the hazardous material (or at least that has been thoroughly decontaminated), monitor vital signs.

If the casualty has swallowed a known or identified toxic material, treat the casualty as a poisoned casualty using the information provided above. Dress wounds and prepare the casualty for transport to a treatment facility for a complete medical evaluation and treatment. Care should be taken during transport to stabilize the casualty by maintaining normal body temperature, administering oxygen, and treating shock.

SUMMARY

This chapter covered first aid equipment, supplies, and rescue/transportation of the casualty. The HM should be able to recognize the various types of dressings and bandages, as well as how and when to apply them. The HM should be familiar with protective equipment, rescue operations, the stages of extrication, and the precautionary steps that must be taken in special rescue situations. Additionally, the HM should be acquainted with the different patient-moving devices and lifting techniques. Further, the HM should be able to identify essential basic life support equipment and supplies and should be able to recognize different forms of emergency transportation. Finally, the HM should now be able to recall preparatory, en route, and turnover procedures for casualties being transported to treatment facilities. The HM may stay informed through contact with the local Poison Control Center, MEDIC releases, or via the World Wide Web on the Internet.