Chapter 39
Terrorism Response and Disaster Management

Unit Summary

After students complete this chapter and the related course work, they will be able to describe what constitutes terrorism and the EMT’s response to terrorism, and they will be able to apply this knowledge. Additionally, the student will demonstrate an understanding of weapons of mass destruction (WMD) agents and countermeasures, as well as a fundamental knowledge of disaster management safety.

National EMS Education Standard Competencies

EMS Operations

Knowledge of operational roles and responsibilities to ensure patient, public, and personnel safety.

Mass-Casualty Incidents Due to Terrorism and Disaster

Risks and responsibilities of operating on the scene of a natural or man-made disaster. (pp 1427–1448)

Knowledge Objectives

1. Define the terms international terrorism and domestic terrorism, and provide some examples of incidents that have been caused by each one. (pp 1427–1428)
2. Provide examples of four different types of goals that commonly motivate terrorist groups to stage a terrorist attack. (pp 1427–1428)
3. Define the terms weapon of mass destruction (WMD) and weapon of mass casualty (WMC), and list and give examples of the five categories of weapons that are considered WMDs. (pp 1428–1429)
4. Discuss the history of chemical agents, their four main classifications, routes of exposure, effects on the patient, and patient care. (pp 1429, 1432–1438)
5. Discuss three categories of biologic agents, their routes of exposure, effects on the patient, and patient care. (pp 1429, 1432–1438)
6. Describe the history of nuclear/radiologic devices, sources of radiologic materials and dispersal devices, medical management of the patient, and protective measures that can be taken by the EMT during a nuclear/radiologic incident. (pp 1429, 1445–1447)
7. Describe how the Department of Homeland Security (DHS) Homeland Security Advisory System relates to the daily activities of EMTs and their ability to respond to and survive a terrorist attack. (pp 1429–1430)
8. Describe key observations an EMT must make on each call to assist in the determination of whether an incident is related to terrorism. (pp 1429–1432)
9. Explain the colors and threat levels that are used by the DHS daily to heighten awareness of the current terrorist threat. (p 1430)
10. Describe the critical response actions related to establishing and reassessing scene safety, personnel protection, notification procedures, and establishing command an EMT must perform at a suspected terrorist event. (pp 1430–1432)
11. Explain the role of EMS in relation to syndromic surveillance and points of distribution (PODS) during a biologic event. (pp 1444–1445)
12. Describe the mechanisms of injury caused by incendiary and explosive devices, including the types of wounds and their severity. (pp 1447–1448)
Skills Objectives

1. Demonstrate the steps an EMT can take to establish and reassess scene safety based on a scenario of a terrorist event. (pp 1430–1432)
2. Demonstrate the steps an EMT can take for the management of a patient exposed to a chemical agent. (pp 1432–1438)
3. Demonstrate the use of the Mark 1 Nerve Agent Antidote Kit (NAAK) and/or the DuoDote Auto-Injector. (pp 1436–1437)

Lecture

I. Introduction

A. It is possible that you may be called on to respond to a terrorist event at some time during your career.
   1. The question is not will terrorists strike again, but rather when and where they will strike.
   2. You must be mentally and physically prepared for the possibility of a terrorist event.

B. It is difficult to plan and anticipate a response to many terrorist events, yet there are several key principles that apply to every response.

II. What Is Terrorism?

A. Terrorist forces have been at work since early civilizations.
   1. International terrorism has brought a new fear into the lives of many American citizens.
   2. Modern-day terrorism is common in the Middle East where terrorist groups have frequently attacked civilian populations.
   3. In the United States, domestic terrorists have struck multiple times in previous years.

B. Only a small percentage of groups actually turn toward terrorism as a means to achieve their goals.
   1. Violent religious groups/doomsday cults
      a. Include groups such as Aum Shinrikyo
      b. Some of these groups may participate in apocalyptic violence.
   2. Extremist political groups
      a. Include violent separatist groups and those who seek political, religious, economic, and social freedom
   3. Technology terrorists
      a. Those who attack a population’s technological infrastructure as a means to draw attention to their cause
      b. Cyberterrorists
   4. Single-issue groups
      a. Include antiabortion groups, animal rights groups, anarchists, racists, and even ecoterrorists

III. Weapons of Mass Destruction

A. A weapon of mass destruction (WMD), or weapon of mass casualty (WMC), is any agent designed to bring about:
   1. Mass death
   2. Casualties
   3. Massive damage to property and infrastructure (bridges, tunnels, airports, and seaports)

B. B-NICE and CBRNE are mnemonics to remember the kinds of weapons of mass destruction.
1. B-NICE
   a. Biologic
   b. Nuclear
   c. Incendiary
   d. Chemical
   e. Explosive

2. CBRNE
   a. Chemical
   b. Biologic
   c. Radiologic
   d. Nuclear
   e. Explosive

C. To date, the preferred WMD for terrorists has been explosive devices.
   1. WMDs are relatively easy to obtain or create and are specifically geared toward killing large numbers of people.

D. Chemical terrorism/warfare
   1. Chemical agents are manufactured substances that can have devastating effects on living organisms.
   2. They can be produced in liquid, powder, or vapor form depending on the desired route of exposure and dissemination technique.
   3. These agents consist of the following types:
      a. Vescants (blister agents)
      b. Respiratory agents (choking agents)
      c. Nerve agents
      d. Metabolic agents (cyanides)

E. Biologic terrorism/warfare
   1. Biologic agents are organisms that cause disease.
   2. They are generally found in nature; for terrorist use, however, they are cultivated, synthesized, and mutated in a laboratory.
   3. The weaponization of biologic agents is performed to artificially maximize the target population's exposure to the germ.
   4. The primary types are:
      a. Viruses
      b. Bacteria
      c. Toxins

F. Nuclear/radiologic terrorism
   1. There have been only two publicly known incidents involving the use of a nuclear device.
      a. Hiroshima and Nagasaki
   2. It is possible for a terrorist to secure radioactive materials or waste to perpetrate an act of terror.
      a. These materials are far easier for a determined terrorist to acquire and require less expertise to use.
      b. "Dirty bombs" can cause widespread panic and civil disturbances.

IV. EMT Response to Terrorism

A. When you respond to a terrorist event, the basic foundations of patient care remain the same.
   1. However, the treatment can and will vary.
   2. When presented with widespread mass casualties, you must remember situational awareness.
B. Recognizing a terrorist event (indicators)

1. Most acts of terror are covert, which means that the public safety community generally has no prior knowledge of the time, location, or nature of the attack.
   a. You must constantly be aware of your surroundings and understand the possible risks for terrorism.
   b. You must know the current threat level issued by the federal government through the Department of Homeland Security (DHS).

2. The Homeland Security Advisory System alerts responders to the potential for an attack, although the specifics of the current threat will not be given.

3. Know the level at the start of your workday.
   a. Severe (red): Severe risk of terrorist attacks
   b. High (orange): High risk of terrorist attacks
   c. Elevated (yellow): Significant risk of terrorist attacks
   d. Guarded (blue): General risk of terrorist attacks
   e. Low (green): Low risk of terrorist attacks

4. Once you are on duty, you must be able to make appropriate decisions regarding the potential for a terrorist event. On every call, make the following observations:
   a. Type of location
      i. Is the location a monument, infrastructure, government building, or religious building?
      ii. Is there a large gathering?
   b. Type of call
      i. Is there a report of an explosion or suspicious device?
      ii. Does someone have unexplained coughing and difficulty breathing?
      iii. Are there reports of people fleeing the scene?
   c. Number of patients
      i. Are there multiple victims with similar signs and symptoms?
      ii. This is probably the single most important clue that a terrorist attack or an incident involving a WMD has occurred.
   d. Victims’ statements
      i. The second best indication of a terrorist or WMD event
   e. Preincident indicators
      i. Is the terror level high or severe?
      ii. Has there been a recent increase in violent political activism?
      iii. Are you aware of any credible threats made against the location, gathering, or occasion?

C. Response actions

1. Scene safety
   a. Ensure that the scene is safe, remembering to stage your vehicle a safe distance from the incident.
   b. Wait for law enforcement personnel to advise you that the scene has been made secure.
   c. If you have any doubt that it may not be safe, do not enter.
   d. The best location for staging is upwind and uphill from the incident.
   e. Remember the following rules:
      i. Failure to park your vehicle at a safe location can place you and your partner in danger.
      ii. If your vehicle is blocked in by other emergency vehicles or damaged by a secondary device, you will be unable to provide victims with transportation or escape yourself.

2. Responder safety (personnel protection)
   a. The best form of protection from a WMD agent is preventing yourself from coming into contact with the agent.
b. The greatest threats facing you in a WMD attack are contamination and cross-contamination.
   i. Contamination with an agent occurs when you have direct contact with the WMD or are exposed to it.
   ii. Cross-contamination occurs when you come into contact with a contaminated person who has not yet been decontaminated.

3. Notification procedures
   a. Notify the dispatcher, providing that communications function properly.
   b. Inform dispatch of:
      i. The nature of the event
      ii. Any additional resources that may be required
      iii. The estimated number of patients
      iv. The upwind route of approach or optimal route of approach
   c. It is extremely important to establish a staging area, where other units will converge.
      i. Be mindful of access and exit routes when you direct units to respond to a location.
   d. Trained responders in the proper protective equipment are the only persons equipped to handle the WMD incident.
   e. Keep in mind that there may be more than one type of device or agent present.

4. Establishing command
   a. As the first person on scene, the EMT may need to establish command until additional personnel arrive.
   b. You and other EMTs may function as:
      i. Medical branch directors
      ii. Triage supervisors
      iii. Treatment supervisors
      iv. Transportation supervisors
      v. Logistic officers
      vi. Command and general staff
   c. If the initial incident command system (ICS) is already in place, immediately seek out the medical staging officer to receive your assignment.

5. Secondary device or event (reassessing scene safety)
   a. Terrorists have been known to plant additional explosives that are set to explode after the initial bomb.
      i. This type of secondary device is intended primarily to injure responders and to secure media coverage.
      ii. Secondary devices may include various types of electronic equipment such as cell phones or pagers.
   b. It is every EMT’s responsibility to constantly assess and reassess the scene for safety.

V. Chemical Agents

A. Chemical agents are liquids or gases that are dispersed to kill or injure.
   1. The characteristics of an agent can be described as liquid, gas, or solid material.
   2. Persistent or nonvolatile agents can remain on a surface for long periods, usually longer than 24 hours.
   3. Nonpersistent or volatile agents evaporate rapidly when left on a surface in the optimal temperature range.
   4. Route of exposure is a term used to describe how the agent most effectively enters the body.
      a. Agents with a vapor hazard enter the body through the respiratory tract in the form of vapors.
      b. Agents with a contact hazard (or skin hazard) give off very little vapor or no vapors and enter the body through the skin.

B. Vesicants (blister agents)
   1. The primary route of exposure of blister agents, or vesicants, is the skin.
2. However, if vesicants are left on the skin or clothing long enough, they produce vapors that can enter the respiratory tract.

3. Vesicants cause burnlike blisters to form on the victim’s skin and in the respiratory tract.

4. The vesicant agents consist of:
   a. Sulfur mustard (H)
   b. Lewisite (L)
   c. Phosgene oxime (CX)

5. The vesicants usually cause the most damage to damp or moist areas of the body, such as the armpits, groin, and respiratory tract.

6. Signs of vesicant exposure on the skin include the following:
   a. Skin irritation, burning, and reddening
   b. Immediate, intense skin pain
   c. Formation of large blisters
   d. Gray discoloration of skin
   e. Swollen and closed or irritated eyes
   f. Permanent eye injury (including blindness)

7. If vapors were inhaled, the patient may experience these signs/symptoms:
   a. Hoarseness and stridor
   b. Severe cough
   c. Hemothysis (coughing up blood)
   d. Severe dyspnea

8. Sulfur mustard is a brownish, yellowish oily substance that is generally considered very persistent.
   a. As the agent is absorbed into the skin, it begins an irreversible process of damage to the cells.
   b. Mustard is considered a mutagen, which means that it mutates, damages, and changes the structures of cells.
   c. The patient will develop a progressive reddening of the affected area, which will gradually develop into large blisters.
   d. Mustard also attacks vulnerable cells within the bone marrow and depletes the body’s ability to reproduce white blood cells.

9. Lewisite and phosgene oxime produce blister wounds very similar to those caused by mustard.
   a. These agents produce immediate intense pain and discomfort when contact is made.
   b. The patient may have a grayish discoloration at the contaminated site.

10. Vesicant agent treatment
    a. There are no antidotes for mustard or CX exposure.
    b. British anti-Lewisite is the antidote for agent L; however, it is not carried by civilian EMS.
    c. Ensure that the patient has been decontaminated before the ABCs are initiated.
    d. Transport should be initiated as soon as possible.
    e. Generally, burn centers are best equipped to handle the wounds and subsequent infections produced by vesicants.

C. Pulmonary agents (choking agents)

1. The pulmonary agents are gases that cause immediate harm to persons exposed to them.
2. The primary route of exposure is through the respiratory tract, which makes them an inhalation or vapor hazard.
3. Once inside the lungs, they damage the lung tissue and fluid leaks into the lungs.
4. These agents produce respiratory-related symptoms such as:
   a. Dyspnea
   b. Tachypnea
   c. Pulmonary edema
5. Chlorine (CL) was the first chemical agent ever used in warfare.
   a. Initially it produces upper airway irritation and a choking sensation.
   b. The patient may later experience these signs/symptoms:
      i. Shortness of breath
      ii. Chest tightness
      iii. Hoarseness and stridor
      iv. Gasping and coughing

6. Phosgene has been produced for chemical warfare and is a product of combustion such as might be produced in a fire at a textile factory.
   a. Phosgene is a very potent agent that has a delayed onset of symptoms, usually hours.
   b. The odor produced by the chemical is similar to that of freshly mown grass or hay.
      i. The result is that much more of the gas is allowed to enter the body unnoticed.
   c. Initially, a mild exposure may include these signs/symptoms:
      i. Nausea
      ii. Chest tightness
      iii. Severe cough
      iv. Dyspnea on exertion
   d. A severe exposure produces such large amounts of fluid in the lungs that the patient may actually become hypovolemic and subsequently hypotensive.

7. Pulmonary agent treatment
   a. The best initial treatment is to remove the patient from the contaminated atmosphere.
      i. This should be done by trained personnel in the proper PPE.
   b. Aggressive management of the ABCs should be initiated, paying particular attention to oxygenation, ventilation, and suctioning.
   c. Do not allow the patient to be active.
   d. There are no antidotes to counteract the pulmonary agents.

D. Nerve agents

1. The nerve agents are among the most deadly chemicals developed.
2. Nerve agents can cause cardiac arrest within seconds to minutes of exposure.
3. Nerve agents are a class of chemical called organophosphates, which are found in household bug sprays, agricultural pesticides, and some industrial chemicals.
   a. Organophosphates block an essential enzyme in the nervous system, causing the body’s organs to become overstimulated and burn out.
4. G agents came from the early nerve agents, the G series.
   a. Sarin (GB) is a highly volatile colorless and odorless liquid.
      i. Especially dangerous in enclosed environments
      ii. When it comes in contact with the skin, it is quickly absorbed and evaporates.
      iii. When it is on clothing, it has the effect of off-gassing.
   b. Soman (GD) is twice as persistent as sarin and five times as lethal.
      i. This agent is a contact and an inhalation hazard.
      ii. A unique additive in GD causes it to bind to the cells that it attacks faster than any other agent.
   c. Tabun (GA) is approximately half as lethal as sarin and 36 times more persistent.
      i. It is a contact and an inhalation hazard.
   d. V agent (VX) is a clear oily agent that has no odor and looks like baby oil.
      i. It is more than 100 times more lethal than sarin and is extremely persistent.
ii. It is easily absorbed into the skin, and the oily residue that remains is extremely difficult to decontaminate.

5. Nerve agents all produce similar symptoms but have varying routes of entry.
   a. The symptoms are described using the military mnemonic SLUDGEM.
      i. Salivation, sweating
      ii. Lacrimation (excessive tearing)
      iii. Urination
      iv. Defecation, drooling, diarrhea
      v. Gastric upset and cramps
      vi. Emesis (vomiting)
      vii. Muscle twitching/miosis (pinpoint pupils)
   b. The medical mnemonic DUMBELS is also used:
      i. Diarrhea
      ii. Urination
      iii. Miosis
      iv. Bradycardia, bronchospasm
      v. Emesis
      vi. Lacrimation
      vii. Seizures, salivation, sweating

6. Miosis is the most common symptom of nerve agent exposure and can remain for days to weeks.

7. Nerve agent treatment (Mark 1 NAAK)
   a. Fatalities from severe nerve agent exposure occur as a result of respiratory complications, which lead to respiratory arrest.
   b. You can greatly increase the patient’s chances of survival simply by providing airway and ventilatory support.
   c. Often in patients exposed to these agents, seizures will begin and will not stop.
      i. These patients will require administration of nerve agent antidote kits.
   d. In terms of medical treatment, the most common treatment is the Mark 1 Nerve Agent Antidote Kit (NAAK).
      i. Contains atropine and 2-PAM
      ii. An updated version is the DuoDote Auto-Injector.
      iii. These medications are delivered using the same technique as the EpiPen auto-injector.
      iv. Multiple doses may need to be administered.

E. Metabolic agents (cyanides)

1. Hydrogen cyanide (AC) and cyanogen chloride (CK) are both agents that affect the body’s ability to use oxygen.
   a. Cyanide is a colorless gas with an odor like almonds.

2. Besides the nerve agents, metabolic agents are the only chemical weapons known to kill within seconds to minutes.
   a. These deadly gases are commonly found in many industrial settings.

3. In low doses, these chemicals are associated with dizziness, light-headedness, headache, and vomiting.

4. High doses will produce symptoms that include the following:
   a. Shortness of breath and gasping respirations
   b. Tachypnea
   c. Flushed skin
   d. Tachycardia
   e. Altered mental status
f. Seizures

g. Coma

h. Apnea

i. Cardiac arrest

5. Cyanide agent treatment

a. Cyanide binds with the body’s cells, preventing oxygen from being used.
b. Once trained personnel wearing the proper PPE have removed the patient from the source of exposure, all of the patient’s clothes must be removed to prevent off-gassing in the ambulance.
c. Support the patient’s ABCs.
   i. Mild effects will generally resolve by removing the victim from the source of contamination and administering supplemental oxygen.
   ii. Severe exposure will require aggressive oxygenation and perhaps ventilation with supplemental oxygen.
   iii. Always use a bag-mask device or oxygen-powered ventilator device.
d. If no antidote is available, initiate transport immediately.

VI. Biologic Agents

A. Biologic agents pose many difficult issues when used as a WMD.

1. Biologic agents can be almost completely undetectable.
2. Most of the diseases caused by these agents will be similar to other minor illnesses.

B. Biologic agents are grouped as viruses, bacteria, and neurotoxins and may be spread in various ways.

1. Dissemination is the means by which a terrorist will spread the agent.
2. A disease vector is an animal that spreads disease, once infected, to another animal.
3. How easily the disease is able to spread from one human to another human is called communicability.
   a. In instances when communicability is high, such as with smallpox, the person is considered contagious.
4. Incubation describes the period of time between the person becoming exposed to the agent and symptoms beginning.

C. Viruses

1. Viruses are germs that require a living host to multiply and survive.
2. Once in the body, the virus invades healthy cells and replicates itself to spread through the host.
3. Viruses move from host to host by direct methods, such as respiratory droplets, or through vectors.
4. Smallpox
   a. Smallpox is a highly contagious disease.
   b. All forms of standard precautions must be used to prevent cross-contamination to health care providers.
   c. Wear examination gloves, a HEPA-filtered respirator, and eye protection.
   d. Before the rash and blisters show, the illness will start with a high fever and body aches and headaches.
   e. An easy, quick way to differentiate the smallpox rash from other skin disorders is to observe the size, shape, and location of the lesions.
      i. In smallpox, all the lesions are identical in their development.
      ii. Smallpox blisters begin on the face and extremities and eventually move toward the chest and abdomen.
      iii. The disease is in its most contagious phase when the blisters begin to form.

5. Viral hemorrhagic fevers (VHF)
   a. VHF’s consist of a group of diseases caused by viruses that include the Ebola, Rift Valley, and yellow fever viruses, among others.
   b. This group of viruses causes the blood in the body to seep out from the tissues and blood vessels.
c. Initially, the patient will have flulike symptoms, progressing to more serious symptoms such as internal and external hemorrhaging.
d. All standard precautions must be taken when treating these illnesses.

D. Bacteria

1. Unlike viruses, bacteria do not require a host to multiply and live.
2. Bacteria are much more complex and larger and can grow up to 100 times larger than the largest virus.
3. Most bacterial infections can be fought with antibiotics.
4. Most bacterial infections will generally begin with flulike symptoms.
5. Inhalation and cutaneous anthrax (*Bacillus anthracis*)
   a. Anthrax is caused by a deadly bacterium that lays dormant in a spore.
   b. When exposed to the optimal temperature and moisture, the germ will be released from the spore.
   c. The routes of entry are inhalation, cutaneous, and gastrointestinal.
      i. The inhalation form, or pulmonary anthrax, is the most deadly and often presents as a severe cold.
      ii. Pulmonary anthrax is associated with a 90% death rate if untreated.
   d. Antibiotics can be used to treat anthrax successfully.
6. Plague (bubonic/pneumonic)
   a. The plague's natural vectors are infected rodents and fleas.
   b. Bubonic plague infects the lymphatic system.
      i. When this occurs, the patient's lymph nodes become infected and grow.
      ii. The glands of the nodes will grow large and round, forming buboes.
      iii. If left untreated, the infection may spread through the body, leading to sepsis and possibly death.
   c. Pneumonic plague is a lung infection, also known as plague pneumonia, that results from inhalation of plague bacteria.
      i. This form of the disease is contagious and has a much higher death rate than the bubonic form.

E. Neurotoxins

1. Neurotoxins are the most deadly substances known to humans.
2. These toxins are produced from plants, marine animals, molds, and bacteria.
3. The route of entry is through ingestion, inhalation from aerosols, or injection.
4. Unlike viruses and bacteria, they are not contagious and have a faster onset of symptoms.
5. Botulinum toxin
   a. The most potent neurotoxin is botulinum, which is produced by bacteria.
   b. When introduced into the body, the neurotoxin affects the nervous system's ability to function.
      i. Voluntary muscle control diminishes as the toxin spreads.
      ii. Eventually the toxin causes muscle paralysis, leading to respiratory arrest.
6. Ricin
   a. Ricin is derived from mash that is left from the castor bean.
   b. When introduced into the body, ricin causes pulmonary edema and respiratory and circulatory failure leading to death.
   c. The toxin is quite stable and extremely toxic by many routes of exposure, including inhalation.
   d. Signs and symptoms of ricin ingestion are as follows:
      i. Fever
      ii. Chills
      iii. Headache
      iv. Muscle aches
      v. Nausea
vi. Vomiting
vii. Diarrhea
viii. Severe abdominal cramping
ix. Dehydration
x. Gastrointestinal bleeding
xi. Necrosis of the liver, spleen, kidneys, and GI tract
e. Signs and symptoms of ricin inhalation are as follows:
  i. Fever
  ii. Chills
  iii. Nausea
  iv. Local irritation of eyes, nose, and throat
  v. Profuse sweating
  vi. Headache
  vii. Muscle aches
  viii. Nonproductive cough
  ix. Chest pain
  x. Dyspnea
  xi. Pulmonary edema
  xii. Severe lung inflammation
  xiii. Cyanosis
  xiv. Seizures
  xv. Respiratory failure
f. Treatment is supportive and includes both respiratory support and cardiovascular support as needed.

F. Other EMT roles during a biologic event
   1. Syndromic surveillance
      a. Syndromic surveillance is the:
         i. Monitoring of patients presenting to emergency departments and alternative care facilities
         ii. Recording of EMS call volume
         iii. Monitoring of the use of over-the-counter medications
      b. Patients with signs and symptoms that resemble influenza are particularly important.
      c. Quality assurance and dispatch operations need to be aware of an unusual number of calls from patients with unexplainable flu coming from a particular region or community.
   2. Points of distribution (Strategic National Stockpile)
      a. PODs are existing facilities that are established in a time of need, for the mass distribution of antibiotics, antidotes, vaccinations, and other medications and supplies.
      b. These medications may be delivered in large containers known as push packs by the Centers for Disease Control and Prevention National Pharmaceutical Stockpile.
         i. These containers have a delivery time of 12 hours anywhere in the country.
      c. EMTs, AEMTs, and paramedics may be called on to assist in the delivery of the medications to the public.
         i. Your role may include triage, treatment, and transport.

VII. Radiologic/Nuclear Devices

A. What is radiation?
   1. Ionizing radiation is emitted in the form of rays, or particles.
   2. This energy can be found in radioactive material, such as rocks and metals.
a. Radioactive material is any material that emits radiation.
b. This material is unstable, and it attempts to stabilize itself by changing its structure in a natural process called decay.

3. The energy that is emitted from a strong radiologic source is alpha, beta, gamma (x-ray), or neutron radiation.
   a. Alpha is the least harmful penetrating type and cannot move through most objects.
   b. Beta radiation is slightly more penetrating than alpha and requires a layer of clothing to stop it.
   c. Gamma rays are far faster and stronger than alpha and beta rays.
      i. These rays easily penetrate through the human body and require lead or several inches of concrete to prevent penetration.
   d. Neutron particles are among the most powerful forms of radiation.
      i. Neutrons easily penetrate through lead and require several feet of concrete to stop them.

B. Sources of radiologic material
   1. Radiologic materials are generally used for purposes that benefit humankind, such as:
      a. Medicine
      b. Killing germs in food
      c. Construction work
   2. Once radiologic material has been used for its purpose, the material remaining is called radiologic waste; these materials can be found at:
      a. Hospitals
      b. Colleges and universities
      c. Chemical and industrial sites

C. Radiologic dispersal devices (RDDs)
   1. An RDD is any container that is designed to disperse radioactive material.
   2. A dirty bomb carries the potential to injure victims with not only the radioactive material, but also the explosive material used to deliver it.
   3. The destructive capability of a dirty bomb is limited to the explosives that are attached to it.
   4. The dirty bomb is an ineffective WMD.

D. Nuclear energy
   1. Nuclear energy is artificially made by altering (splitting) radioactive atoms.
   2. The result is an immense amount of energy that usually takes the form of heat.
   3. Nuclear material is used in:
      a. Medicine
      b. Weapons
      c. Naval vessels
      d. Power plants
   4. Nuclear material gives off all forms of radiation, including neutrons.

E. Nuclear weapons
   1. Nuclear weapons are kept only in secure facilities throughout the world.
   2. The likelihood of a nuclear attack is extremely remote.
   3. Due to the collapse of the former Soviet Union, the whereabouts of many small nuclear devices is unknown.
      a. These small suitcase-sized nuclear weapons are called Special Atomic Demolition Munitions (SADMs).
      b. Perhaps as many as 80 are missing as of 1998.

F. Symptomatology
1. The effects of radiation exposure will vary depending on the amount of radiation that a person receives and the route of entry.
2. Radiation can be introduced into the body by all routes of entry as well as through the body (irradiation).
3. Some common signs of acute radiation sickness are listed in Table 39-11.

G. Medical management

1. Being exposed to a radiation source does not make a patient contaminated or radioactive.
2. However, when patients have a radioactive source on their body, they are contaminated and must be initially cared for by a HazMat responder.
3. Once the patient is decontaminated, you may begin treatment with the ABCs and treat the patient for any burns or trauma.

H. Protective measures

1. There are no suits or protective gear designed to completely shield you from radiation.
2. The best ways to protect yourself from the effects of radiation:
   a. Time
      i. The less time that you are exposed to the source, the less the effects will be.
      ii. If you realize that the patient is near a radiation source, leave the area immediately.
   b. Distance
      i. Radiation is limited in how far it can travel.
      ii. Depending on the type of radiation, often moving only a few feet is enough to remove you from immediate danger.
      iii. Make certain that responders are stationed far enough from the incident.
   c. Shielding
      i. Always assume that you are dealing with the strongest form of radiation and use concrete shielding between yourself and the incident.

VIII. Incendiary and Explosive Devices

A. Incendiary and explosive devices come in various shapes and sizes.

1. It is important for you to be able to identify an object you believe is a potential device, notify the proper authorities, and safely evacuate the area.
2. Remember that there is the possibility of a secondary device when you are responding to the scene.

B. Mechanisms of injury

1. The type and severity of wounds primarily depend on the patient’s distance from the epicenter of the explosion.
2. Blast injuries occur in a number of ways.
   a. Primary blast injury
      i. Due solely to the direct effects of the pressure wave on the body
      ii. The injury is seen almost exclusively in the hollow organs of the body.
      iii. An injury to the lungs causes the greatest morbidity and mortality.
   b. Secondary blast injury
      i. Penetrating or nonpenetrating injury that results from being struck by flying debris
      ii. Objects are propelled by the force of the blast and strike the victim, causing injury.
   c. Tertiary blast injury
      i. Results from whole body displacement and subsequent traumatic impact with environmental objects
      ii. Other indirect effects include crush injury from the collapse of structures and toxic effects from the inhalation of combustion gases.
3. The physics of an explosion
a. When a substance is detonated, a solid or liquid is chemically converted into large volumes of gas under high pressure with resultant explosive energy release.

b. This generates a pressure pulse in the shape of a spherical blast wave that expands in all directions from the point of explosion.

c. Flying debris and high winds commonly cause conventional blunt and penetrating trauma.

4. Tissues at risk

a. Hollow organs such as the middle ear, lung, and GI tract are most susceptible to pressure changes.

b. The junction between tissues of different densities and exposed tissues such as the head and neck are prone to injury as well.

c. The ear is the organ system most sensitive to blast injuries.
   i. The patient may complain of ringing or pain in the ears or some loss of hearing, and blood may be visible in the ear canal.

d. Primary pulmonary blast injuries occur as contusions and hemorrhages.
   i. Patients may complain of tightness or pain in the chest and may cough up blood and have tachypnea or other signs of respiratory distress.
   ii. Subcutaneous emphysema over the chest can be palpated.
   iii. Pneumothorax is common and may require emergency decompression.

e. Solid organs are relatively protected from shockwave injury but may be injured by secondary missiles or a hurled body.

f. Hollow organs may be injured by similar mechanisms as lung tissue.
   i. Petechiae to large hematomas are the most visible sign.

g. Neurologic injuries and head trauma are the most common causes of death from blast injuries.
   i. Subarachnoid and subdural hematomas are often seen.
   ii. Permanent or transient neurologic deficits may be secondary to concussion, intracerebral bleeding, or air embolism.
   iii. Instant but transient unconsciousness may be initiated.
   iv. Bradycardia and hypotension are common after an intense pressure wave from an explosion.

h. Extremity injuries, including traumatic amputations, are common.

IX. Summary

A. As a result of the increase in terrorist activity, it is possible that you, the EMT, could witness a terrorist event. You must be mentally and physically prepared for the possibility of a terrorist event.

B. Types of groups that tend to use terrorism include violent religious groups/doomsday cults, extremist political groups, technology terrorists, and single-issue groups.

C. A weapon of mass destruction (WMD) is any agent designed to bring about mass death, casualties, and/or massive damage to property and infrastructure. These can be biologic, nuclear, incendiary, chemical, and explosive weapons (B-NICE).

D. Indicators that may give you clues as to whether the emergency is the result of a terrorist attack include the type of location, type of call, number of patients, victims' statements, and preincident indicators.

E. If you suspect that a terrorist or a WMD event has occurred, ensure that the scene is safe. If you have any doubt that it may not be safe, do not enter. Wait for assistance.

F. Terrorists may set secondary devices that are designed to explode after the initial bomb, thus injuring responders and media coverage. Constantly assess and reassess the scene for safety.

G. Chemical agents are manufactured substances that can have devastating effects on living organisms.

H. The route of exposure is how the agent most effectively enters the body.

I. Biologic agents are organisms that cause disease.
J. Biologic agents include viruses such as smallpox and those that cause viral hemorrhagic fevers; bacteria such as those that cause anthrax and plague; and neurotoxins such as botulinum toxin and ricin.

K. Nuclear or radiologic weapons can create a massive amount of destruction.

L. Ionizing radiation is energy that can enter the human body and cause damage.

M. Explosive and incendiary devices come in various shapes and sizes. It is important to be able to identify an object you believe is a potential device and notify the proper authorities, while safely evacuating the area.
Unit Assessment

1. What does the acronym WMD stand for?

2. How many levels exist in the Homeland Security Advisory System?

3. What is a secondary device and who are its targets?

4. List the four different categories of chemical agents that may be used in terrorism.

5. What is the primary action of nerve agents that causes death?

6. Explain why biologic agents can affect a larger population than chemical agents can with a similar exposure.

7. How do the lesions seen in smallpox differ than those seen in other rashes?

8. What type of pathogen is anthrax?

9. Which neurotoxin is the most potent?

10. What is a radiologic dispersal device (RDD)?