# Disaster Nursing: Bioterrorism

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The icon ✦ denotes content of special importance for NCLEX®.

## INTRODUCTION TO DISASTER NURSING

A. Preparedness for a terrorist-caused disaster is critical for containment and protection of the population.
B. The Centers for Disease Control and Prevention (CDC) has developed a strategic plan based on five focus areas.
   1. Preparedness and prevention.
   2. Detection and surveillance.
   3. Diagnosis and characterization of biological and chemical agents.
   4. Response.
   5. Communication.
✦ C. Disaster is defined as an event of such magnitude that essential services are disrupted and current resources are overwhelmed.
   1. Disasters may be natural (caused by an earthquake, hurricane, tornado, blizzard, flood, etc.).
   2. Disasters may be caused by human actions such as civil disturbance, a hazardous material incident, or act of terrorism.
   3. Disasters have several characteristics in common.
      a. They are unexpected with little or no warning.
      b. Lives, public health, and the environment are endangered.
      c. Emergency services and personnel must be called to action.
D. Public policy in relation to mass casualties.
   1. Hospitals are the last link in community response to a mass-casualty incident and will receive most seriously injured and ill casualties.
   ✦ 2. Hospitals must follow federal legislation known as EMTALA (Emergency Medical Treatment and Labor Act).
      a. By federal law, a hospital is not allowed to turn away clients.
      b. EMTALA ensures that all individuals must be screened, evaluated, and stabilized before being transferred.
   3. The Public Health Security and Bioterrorism Response Act of 2002 authorizes $4.3 billion to combat terrorism through detection, treatment, and containment.
E. A disaster's impact on the infrastructure will affect transportation, electrical systems, telephone, water, and fuel supplies.
F. The Joint Commission (TJC) has focused on security management and has a developed plan.
   1. Provides for designation of personnel to report and investigate security incidents.
   2. Provides identification for participants.
   3. Controls access to and egress from sensitive areas.
   4. Provides an education program and performance standards for a mass-casualty event.

## NATURAL DISASTERS

A. The type and timing of a disaster event will determine the types of injuries or illnesses that occur.
   1. Disasters may have a prior warning—hurricanes or floods.
   2. Disasters may occur with no warning—tsunamis or earthquakes.
B. Natural disasters include earthquakes, hurricanes, floods, tornadoes, tsunamis, typhoons, volcano eruptions, wildfires, landslides/mudslides, extreme heat, and snow or extreme cold.
C. Natural disasters affect public health.
   1. Access to medical care is limited.
   2. Resources (food, water, medicines) are limited or depleted.
D. Government agencies cannot always provide immediate relief. (Hurricane Katrina was an example of this situation.)
E. Develop a home disaster kit.
   1. Water: 1 gallon/person/day for a minimum of 1–2 weeks.
   2. Food: selection of ready-to-eat foods—nonperishable, easy-to-prepare items high in protein—for l–2 weeks.
   3. Flashlight.
   4. Extra batteries.
   5. Multipurpose tool (e.g., Swiss army knife).
   6. Family and emergency contact information.
   7. Extra cash.
   8. Emergency blanket (one per person).
   9. Map(s) of the area.
   10. Extra set of car keys and house keys.
   11. Manual can opener.
   12. First aid kit with bandages, gloves, soap, $H_2O_2$, over-the-counter medications for pain, stomach problems, etc.
   13. Prescription drugs (with written prescriptions) essential for health (insulin, heart medications), 1-month supply.
   14. Various supplies—battery-powered or hand crank radio (NOAA weather radio, if possible); oil-burning lamps; wood for heat; personal maintenance items such as contact lenses, denture needs, feminine products, sanitation and personal hygiene products.

15. Appropriate clothing and bedding supplies, rain protection gear, sleeping bags.
16. Family documents—personal identification, passports, wills, trusts, insurance records.
17. Credit cards, ATM cards, and cash.

F. Check and replenish supplies and kits once a year; update your disaster plan with the family and practice evacuation procedures.

**SAFETY ISSUES IN DISASTER PREPARATION**

| Issue | Preparation |
|---|---|
| No electricity | Have flashlights, batteries, oil lamps. |
| Gas lines broken | Turn off gas, anchor gas-powered water heater. |
| Oil not available | Have wood available to burn. |
| Structure may collapse | Have building inspected.<br>Have home bolted to foundation.<br>Plan safe areas in the home.<br>Carry a whistle to notify searchers. |
| No communication available | Carry a cell phone—keep cell phone charged.<br>Have available battery radio for information. |
| Food and water are contaminated | Keep 1 gallon of water/person/day for 15 days.<br>Have a portable water purifier available.<br>Have a safe food supply stored for 1 week. |
| Lack of sanitation | Keep heavy plastic bags, buckets, and shovel available. |

## WEAPONS OF MASS DESTRUCTION

A. Biological agents.
   1. Biological terrorism is the use of specific agents to cause harm or kill people, and includes the use of organisms such as bacteria, viruses, and toxins.
   2. Agents possess unique characteristics.
      a. Easily disseminated or transmitted via person-to-person contact and can be dispersed over a wide geographical area.
      b. Cause high mortality with the potential for major public health impact.
      c. Require specific actions so that public health preparedness is secured.

B. Chemical agents.
   1. Chemical terrorism is the deployment of chemical weapons with the intention of causing death.

**THE DANGER OF BIOLOGICALLY TOXIC AGENTS**

- Biological incidents will be the most difficult of all attacks for the community to recognize and actively coordinate a response.
- Most viruses are useful as bioterror agents—they cause unique signs and symptoms that require intervention and isolation of the victims to prevent spread.
- Specific incapacitating viral or bacterial agents slowly produce signs and symptoms **(Table 7-1)**.
  a. Signs and symptoms are nonspecific and difficult to recognize; onset of incident may remain unknown for days before symptoms appear.
  b. It may be necessary to identify "clusters" of illness—many victims become sick within a short period of time in one location.
- If agents are detected early, most can be treated with antibiotics or antivirals.
- The most common form of agents that could be used in a bioterror attack are bacteria.

   2. Chemical weapons can be pulmonary agents (phosgene, chlorine), cyanide agents (hydrogen cyanide), vesicant agents (mustard, oxime), nerve agents (tabun, sarin, VX), or incapacitating agents (agent 15, BZ).
      a. The most dangerous of these agents are nerve gases (sarin, tabun, VX), which are extremely toxic and easy to disseminate in the air.
      b. Nerve agents are designed to kill people by binding up a compound known as acetylcholinesterase, which is the body's "off" switch.

C. Radiation.
   1. Radioactive substances emit radiation in the form of rays (waves) or extremely small particles.
      a. Charged particles are emitted from ionizing radiation, the most likely to be dispersed following a terrorist attack.
   2. A cell that has been exposed to any type of radiation is damaged and may die.
   3. A critical point of discrimination is whether a victim is exposed to, or contaminated by radiation.
      a. If exposed, the victim is not a hazard to others. Radiation is absorbed by or passes through the body, but does not result in radioactive contamination.
      b. Radioactive contamination resulting from spillage, leakage, deliberate dispersal, or attached to dust particles in the air can be passed on to healthcare workers.

**Table 7-1 BIOTERRORISM AGENTS**

| Disease | Signs and Symptoms | Incubation Period | Person-to-Person Transmission |
|---|---|---|---|
| Anthrax (inhalational) | Nonspecific flulike, with fever, malaise, fatigue, cough. Delayed symptoms—severe respiratory distress. | 1–7 days (usually 48 hours). Can be 6 weeks. | No. |
| Botulism (inhalational) | Increasing muscle weakness, drooping eyelids, blurred vision, difficulty speaking and swallowing; progresses down body to paralysis. | 12–36 hours after exposure. | No. |
| Pneumonic plague | Sudden onset of high fever, chills, chest pain, headache, and cough with bloody sputum. Possibly vomiting and diarrhea. Advanced: skin lesions, respiratory failure. | 2–3 days (1–6 days after exposure). | Yes; through droplet, aerosol. |
| Smallpox | Sudden onset of high fever, headache, and backache. Then, painful rash of small, red spots starts on face and spreads over entire skin surface. Progresses from macules to papules. | 7–17 days after exposure (average is 12 days). | Yes; airborne, droplet, or direct contact with skin lesions (until scabs fall off, 3–4 weeks). |
| Typhoid tularemia | Sudden onset of high fever, weakness, weight loss, chest pain, and cough. | 3–5 days after exposure. | No. |
| Viral hemorrhagic fevers (filoviruses, such as Ebola and Marburg, and arenaviruses, such as Lassa and Junin) | Sudden onset of fever, muscle aches, and profound weakness, followed by circulatory compromise. | 2–21 days after exposure. | Yes; risk higher during late stages of disease. |
| Ricin toxin | Depends on route of exposure: ingestion (nausea, vomiting, cramps); aerosol (cough, fever, cardiovascular collapse). | Hours to 3–4 days. | No. |

*Source*: Adapted from Smith, S., & Duell, D. (2008). *Clinical nursing skills* (7th ed.). Upper Saddle River, NJ: Prentice Hall Health.

- ✦ 4. Measuring radiation.
  - a. A rad (radiation-absorbed dose) is a unit of measure for radiation exposure; 1 rad results in absorption of 100 ergs of energy/gram of tissue exposed.
  - b. The international system measures the unit of exposure by gray (gy). 1 gy equals 100 rads.
  - c. Radiation dose is a specific calculated measurement of the amount of energy deposited in the body.
  - d. The unit of dose is called rem, which takes into account the type of radiation.
  - e. A survey instrument measures radiation levels.
    - (1) The readout is in units of R (either rad or rem), which is exposure or dose.
    - (2) An instrument reading of 50 R/hr tells the healthcare worker that if he stays in the exposed area for 1 hour, he will receive a 50-rad exposure.
    - (3) A radiation detection device (film badge) should be worn by personnel who come in contact with the exposed area or victims.
- ✦ 5. Health effects of radiation.
  - a. A victim contaminated by radiation is at risk. How much risk depends on how much radiation is absorbed.
  - b. Victims who absorb less than 0.75 Gy will not experience symptoms of exposure.
  - c. Victims who absorb 8 Gy could die. Between 0.75 and 8 Gy, the victim could develop acute radiation syndrome (ARS).
  - d. Background radiation is derived from natural sources such as radiation from outer space, industrial, academic, military, or radiation used in medicine.
  - e. All of these sources combine to give us a background radiation dose of 0.360 rem per person per year.

## SMALLPOX: AGENT OF TERROR

### Smallpox Disease

*Definition*: An acute viral disease caused by the *variola* virus. It was eradicated in 1977, and in the early 1980s routine

| Treatment | Death Rate if Untreated | Death Rate if Treated | Isolation Precautions/ Standard Precautions |
|---|---|---|---|
| Antibiotics, including Cipro (ciprofloxacin) 500 mg PO q12 hrs. Oracea (doxycycline) 100 mg PO q12 hrs; also, combined IV and PO. | High. | Improved chances for survival. Once symptoms appear, treatment is less effective. | Standard precautions. |
| Antitoxin—requires skin testing. Supportive care and ventilate until victim can breathe on his own. | High. | Low, if breathing can be supported for duration of illness (weeks to months, in some cases). | Standard precautions |
| Antibiotics, including ciprofloxacin 400 mg IV q12 hrs. Doxycycline 200 mg PO, then 100 mg PO q12 hrs. | Almost always fatal. | Treatment is highly effective if taken within 24 hours of first symptoms. | Bubonic form: Standard precautions. pneumonic form: Standard precautions plus droplet precautions until 48–72 hours after antibiotic treatment. |
| Vaccination is effective if given within 3–4 days of exposure; passive immunization with VIG if 3 days postexposure. | 3–30%. | If vaccinated, less than 1%. | Strict isolation precautions: airborne (includes N95 mask) and contact, in addition to standard precautions. |
| Antibiotics, including doxycycline and ciprofloxacin. | 33%. | 1–3% if treated within 24 exposure. | Standard precautions. |
| Little is known. Antiviral agents, such as Rebetol (ribavirin), may be useful. | 15–90%. | Unknown. | Strict isolation precautions, including negative-pressure room with anteroom. |
| No approved antitoxin; high O2, supportive therapy. | Death is probable outcome. | High. | Isolation precautions. |

vaccinations were discontinued. Because there is a large nonimmune population, authorities fear it could be a bioterrorism weapon, transmitted via the airborne route as aerosol.

✦ **Characteristics**

A. Recognize clinical features.
   1. Initially, symptoms resemble an acute viral illness like influenza with fever, myalgia, headache, and backache.
   2. Rash appears, progressing from macules to papules (in 1 week) to vesicles, and then to scabs over in 1–2 weeks.
   3. Distinguishing rash from varicella (chickenpox): smallpox has a synchronous onset on face and extremities, rather than arising in "bunches," starting on the trunk.

B. Mode of dissemination and incubation period.
   1. Smallpox is transmitted by large and small respiratory droplets; thus, both respiratory and oral secretions spread the disease, as well as lesion drainage.
   2. Clients are considered more infectious if they are coughing or have a hemorrhagic form of the disease.
   3. Vaccination effective if given within 3 to 4 days.
   4. Incubation: 7–17 days; average is 12 days.

**Assessment**

A. For those clients who have contracted smallpox, identify those in a high-risk group.
B. Assess need for smallpox vaccination.
C. Observe postvaccination reactions and compare with adverse reactions.
D. Assess client's understanding of postvaccination evaluation.

**Implementation**

A. Manage decontamination.
   1. Decontamination of clients is not indicated with smallpox.
   2. Careful management using contact precautions of potentially contaminated equipment and environmental surfaces—clean, disinfect, and sterilize when possible.
   3. Dedicated or disposable equipment for each client should be used.

✦ B. Institute strict isolation precautions *immediately*.
   1. Airborne and contact precautions in addition to standard precautions; includes gloves, gown, eye shields, shoe covers, and correctly fitted masks (very important).
   2. Airborne precautions: microorganisms transmitted by airborne droplet nuclei (particles 5 microns or smaller).
      a. Respiratory protection when entering client's room (particulate respirators, N95); must meet N1OSH standards for particulate respirators.
      b. Isolate in room under negative pressure with high-efficiency particle air (HEPA) filtration.
   3. Contact precautions: clients known to be infected or colonized with organisms that can be transmitted by direct contact or indirect contact with contaminated surfaces.
      a. Perform hand hygiene using antimicrobial agent when entering and leaving room.
      b. Don gloves when entering room.
      c. Wear gown for all client contact or contact with client's environment.
      d. Wear gown when entering room and remove before leaving isolation area.

C. Assign client placement.
   1. Rooms must meet ventilation and engineering requirements for airborne precautions.
      a. Monitored negative air pressure with 6–12 air exchanges/hour.
      b. Appropriate discharge of air to outdoors, or high-efficiency filtration of air.
   2. Door to room must remain closed; private room is preferred. Clients with same diagnosis may be cohorted.
   3. Limit transport of clients; use appropriate mask if unavoidable.

D. Implement therapy.
   1. Postexposure immunization (*vaccine* virus) is available.
      a. Vaccination alone if given within 3 to 4 days of exposure.
      b. Passive immunization (VIG) if greater than 3 days postexposure.
      c. VIG given at 0.6 mL/kg IM. Check with CDC for up-to-date recommendations.
   2. Prophylactic care with precautions.

E. Identify clients exposed to the smallpox virus.
   1. Persons who were exposed to initial release of the virus.
   2. Persons who had face-to-face, household, or close-proximity contact (< 2 meters = 6.5 feet) with a confirmed or suspected smallpox client after client developed fever and until all scabs have separated (no longer infectious).

F. Identify healthcare workers exposed to the virus—must be evaluated for possible vaccination.
   1. Personnel involved in evaluation, care, or transportation of confirmed, probable, or suspected smallpox clients.
   2. Laboratory personnel involved in collection or processing of clinical specimens.
   3. Other persons with increased likelihood of contact with infectious materials from a smallpox client (laundry or medical waste handlers).
   4. Other persons or staff who have a reasonable probability of contact with smallpox clients or infectious materials (e.g., selected law enforcement, emergency response, or military personnel).
   5. Because of potential for greater spread of smallpox in a hospital setting due to aerosolization of the virus from a severely ill client, all individuals in the hospital may be vaccinated.

G. Determine contraindications for vaccination of noncontacts.
   1. Certain medical conditions (heart disease) have a higher risk of developing severe complications following vaccination.
   2. Diseases or conditions that cause immunodeficiency (HIV, AIDS, leukemia, lymphoma, generalized malignancy, agammaglobulinemia).
   3. Serious, life-threatening allergies to the antibiotics.
   4. Persons who have ever been diagnosed with eczema or other acute or chronic skin conditions such as atopic dermatitis, burns, impetigo or varicella zoster (shingles).
   5. Women who are pregnant.

H. Identify indications for *vaccinia* immune globulin (VIG) administration.
   1. Identify postvaccination complications for which VIG may be indicated.
      a. Eczema vaccinatum is a rare severe adverse reaction to smallpox vaccination. It is characterized by serious local or disseminated, umbilicated, vesicular, crusting skin rashes of the entire body.
      b. Progressive vaccinia (vaccinia necrosum).

c. Severe generalized vaccinia if client has a toxic condition or serious underlying illness.
d. Inadvertent inoculation of eye or eyelid without vaccinial keratitis.

2. Check physician's orders for VIG treatment of complications due to vaccinia vaccination.
3. Administer VIG intramuscularly (IM) as early as possible after onset of symptoms.
4. Give VIG in divided doses over a 24- to 36-hour period. Doses may be repeated at 2- to 3-day intervals until no new lesions appear.

### Collecting and Transporting Specimens

**Implementation**

A. Acquire and follow specific recommendations for diagnostic sampling of the specific agent.
   1. Perform all sampling according to standard precautions.
   2. Check that laboratory has capacity and equipment to handle specific sample. There are four laboratory levels.
      a. Local clinical labs for minimal identification of an agent.
      b. County or state labs.
      c. State and other large labs with advanced capacity for testing.
      d. CDC or select Department of Defense labs with bio safety level (BSL) testing capacity.

B. Wear protective gear when entering environment where potential for exposure exists.
C. Collect specimen and place in appropriate container (zip-closure plastic bag, sealed).
   1. Remove original gloves handling specimen, and place in biohazard container.
   2. Don new pair of gloves.
   3. Place specimen bag in second zip-closure bag and seal, or if specimen is large, in trash bag.

D. Remove protective gear and place in biohazard bags.
E. Perform hand hygiene.
F. Label specimen with appropriate label outside of bag: date, person collecting specimen, location, and contact person.
G. Collect an acute phase serum sample, as well as a later convalescent serum sample for comparison.
H. Transport specimens.
   1. Coordinate with local and state health departments and the Federal Bureau of Investigation (FBI).
   2. Include a chain of custody form with specimen information from moment of collection, completed each time specimen is transferred to another party.

## CHEMICAL AGENT EXPOSURE

**Assessment**

✦ A. Pulmonary agents (chlorine, chloropicrin or phosgene): When inhaled, produce pulmonary edema with little damage to other pulmonary tissues (with resulting hypoxemia) and hypovolemia.
   1. Immediate symptoms are irritation of eyes, nose, and upper airways—often not distinctive enough to be recognized as chemical agent exposure.
   2. About 2 to 24 hours later, victim develops chest tightness, shortness of breath with exertion (later, at rest).
   3. Cough produces clear, frothy sputum, fluid that leaked into lungs.
   4. If symptoms begin soon after exposure, death may occur within hours.

B. Cyanide agents (gases or solids, such as hydrogen cyanide or cyanogen chloride): with high concentrations, death occurs in 6 to 8 minutes.
   1. Initial symptoms are burning irritation of eyes, nose, and airways, and smell of bitter almonds.
   2. Victim's skin may be acyanotic, cherry-red (oxygenated venous blood), or normal.
   3. Large amount of gas inhaled: hyperventilation, convulsions, cessation of breathing (3 to 5 minutes), and no heartbeat (6 to 10 minutes).

C. Vesicant agents: Cause vesicles or blisters; common agents are sulfur mustard and lewisite. More lethal than pulmonary agents and cyanide.
   1. Mustard—initial symptoms not observable; effects begin hours after exposure: erythema, burning and itching with blisters; burning of eyes; airway pain, sore throat, nonproductive cough.
   2. Lewisite—oily liquid that results in topical damage; vapor causes immediate pain, burning and irritation of eyes, skin, and upper airways.
   3. Cellular damage that can result in hypovolemic shock occurs.

✦ D. Nerve agents (sarin, tabun, soman, GF, and VX): liquids or vapors that are the most toxic of all chemical agents.
   1. Nerve agents block the enzyme acetylcholinesterase, so activity in organs, glands, muscles, smooth muscles, and central nervous system cannot turn off; body systems wear out.

2. Effects of nerve agent depends on route (vapor or droplet) of exposure and amount; it is felt within seconds.
   a. Felt first on face: eyes, nose, mouth, and lower airways—watery eyes, runny nose, increased salivation, and constriction of airways, shortness of breath.
   b. The most common sign of nerve vapor exposure is constricted pupils (miosis) with reddened, watery eyes.
   c. Large concentration of vapor: loss of consciousness, convulsions, no breathing.

**Implementation**

✦ A. Pulmonary agents: Client with pulmonary edema must be on immediate bed rest with no exertion and receive oxygen.

B. Cyanide agents: Administer antidotes.
   1. Client inhales amyl nitrite, or is given sodium nitrite intravenously (IV) (10 mL; 300 mg); frees bound cyanide from hemoglobin to allow $O_2$ transport.
   2. Sulfur thiosulfate IV (50 mL; 12.5 g); sulfur converts cyanide to form a nontoxic substance.
   3. Give antidotes sequentially and slowly, titrated to monitor effects; ventilate with oxygen, and correct acidosis.

C. Vesicant agents.
   1. Mustard: Immediate decontamination (within 1 minute) will minimize damage; longer will be too late. Irrigate affected skin areas and eyes frequently and apply antibiotics to skin three to four times/day.
   2. Lewisite: Similar to mustard; immediate decontamination is important. An antidote for systemic lewisite is British anti-Lewisite (BAL), a drug given IV for heavy metal poisoning.

✦ D. Nerve agents.
   1. Personal protection equipment is necessary when decontaminating victims. Decontamination must take place first, before management begins.
   2. Antidotes.
      a. *Atropine*: 2 to 6 mg (average dose 2 to 4 mg) IM. If no improvement, 2 mg more may be administered in 5 to 10 minutes. A high initial dose is necessary to block excess neurotransmitter, especially if victim is unconscious.
      b. *Protopam*, an oxime: 600 mg given slowly IV to counteract nerve agent by removing agent from the enzyme.
      c. *Valium*: might be used for prolonged convulsions.
   3. The military has a device (Mark I Auto-Injection Kit) that holds two spring-powered injectors containing two antidotes, atropine and Protopam, that can be used effectively and quickly to administer antidotes.
   4. Chempacks, which include chemical weapon antidotes, are being shipped to all states from a federal stockpile. Within hours, they will be available following an emergency.

**TRIAGE IN THE HOT ZONE FOLLOWING A CHEMICAL AGENT TERRORIST ATTACK**

- First responders will probably not be able to identify the exact agent.
- Early intervention is critical for nerve agents and cyanide.
- Pulmonary agent exposure will be treated later.
- Intervention in the hot zone generally has to do with airway, breathing, and circulation (ABCs); add antidotes for nerve agents.

## ACUTE RADIATION SYNDROME

**Characteristics**

A. An acute illness characterized by manifestations of cellular deficiencies caused by the body's reaction to ionizing radiation.
   1. Prodromal period: loss of appetite, nausea, vomiting, fatigue, diarrhea.
   2. Latent period: Symptoms disappear for a period of time.
   3. Overt illness follows the latent period: infection, electrolyte imbalance, diarrhea, bleeding.
   4. The final phase is a period of recovery or death.

B. The higher the radiation dose, the greater the severity of early effects and possibility of late effects.

**Assessment**

✦ A. Attempt to identify dose exposure of client. (Treatment is according to dose exposure.)
   1. Dose less than 2 Gy (200 rads) is usually not severe; nausea and vomiting seldom experienced at 0.75 to 1 Gy (75–100 rads) of penetrating gamma rays.
      a. Hospitalization unnecessary at less than 2 Gy, thus outpatient care indicated.

b. Closely monitor and administer frequent CBC with differential blood tests.

2. Dose greater than 2 Gy (200 rads). Signs and symptoms become increasingly severe with increased dose.

✦ B. Identify if radiation dose includes radioactive iodine—uptake of this isotope could destroy thyroid tissue.

C. Identify acute radiation syndromes.

1. Hematopoietic syndrome.
   a. Characterized by deficiencies of RBC, lymphocytes, and platelets, with immunodeficiency.
   b. Increased infectious complications, including bleeding, anemia, and impaired wound healing.
2. Gastrointestinal syndrome.
   a. Characterized by loss of cells lining intestine and alterations in intestinal motility.
   b. Fluid and electrolyte loss with vomiting and diarrhea.
   c. Loss of normal intestinal bacteria, sepsis, and damage to the intestinal microcirculation, along with the hematopoietic syndrome.
3. Cerebrovascular–central nervous system.
   a. Primarily associated with effects on the vasculature and resultant fluid shifts.
   b. Signs and symptoms include vomiting and diarrhea within minutes of exposure, confusion, disorientation, cerebral edema, hypotension, and hyperpyrexia.
   c. Fatal in short time.
4. Skin syndrome.
   a. Can occur with other syndrome.
   b. Characterized by loss of epidermis (and possibly dermis) with "radiation burns."

**Implementation**

A. Give supportive care: Treat gastric distress with $H_2$ receptor antagonists (Tagamet, Pepcid, etc.).

B. Prevent and treat infections: Monitor viral prophylaxis.

C. Consult with hematologist and radiation experts.

D. Observe for erythema, hair loss, skin injury, mucositis, weight loss, and fever.

E. Administer potassium iodide before exposure, if possible, or as soon as available (within 4 hours).

1. Blocks uptake of specific damaging isotope.
2. Protects thyroid tissue.

# PERSONAL PROTECTION EQUIPMENT

**Assessment**

A. Identify clients who present risk to healthcare professionals.

B. Assess need for special equipment (biohazard bags, specimen bags, etc.).

C. Determine type of protection equipment required according to biohazard that is identified (biological, chemical, or radiological).

D. Assess need for decontaminating victims prior to triage.

E. Assess strategy for decontamination at site of incident.

F. Assess need for mass casualty decontamination.

**Implementation**

✦ A. Protective equipment for biological exposure.

1. Respirators—type selected according to hazard identified and its airborne concentration.
   a. High level of protection: self-contained breathing apparatus (SCBA) with full face piece. Provides highest level of protection against airborne hazards when used correctly—reduces exposure to hazard by a factor of 10,000.
   b. Minimal level of protection: half-mask or full face piece air-purifying respirator with particulate filters like N95 (used for TB) or P100 (used for hantavirus).
2. Protective clothing includes gloves and shoe covers—necessary for full protection.
   a. Level A protective suit used when a suspected biological incident occurs and type, dissemination method, and concentration is unknown.
   b. Level B protective suit used when biological aerosol is no longer present.
   c. Full face piece respirator (P100 or HEPA filters) used if agent was *not* aerosoled or dissemination was by letter or package that could be bagged.

✦ B. Protective equipment for chemical exposure.

1. Cover all skin surfaces with protective clothing impervious to chemicals—necessary for protection until exact chemical agent is identified.
   a. Use Mission Oriented Protective Posture (MOPP) suit (chemical protection suit), if available.
   b. Use fire department chemical suits as alternative.

2. Don masks with filtered respirator (HEPA filter respirator—N100 with full face piece—and fit-tested N95 meet CDC performance criteria for chemical exposure).
3. Wear boots or boot covers to prevent tracking contaminant.
4. Initiate decontamination procedures with trained personnel.
   a. Decontaminate at site, if possible.
   b. Otherwise, decontaminate outside of facility.
5. Use chemical detection devices, if available, to validate presence or absence of agent.
   a. M8 paper (sheet of chemically treated paper): If colored spots appear within 20 seconds, chemical agent is present.
   b. M9 tape: Affix adhesive-backed paper to equipment or protective clothing—color changes when exposed to chemical agent.
   c. M2S6A1 chemical agent detector kit: Can detect nerve, blister, or blood agent vapors; a glass ampoule contains substance that, when placed on test spot, changes color.
   d. Chemical agent monitors (CAMs): Contain a microprocessor chip that identifies presence of certain nerve and blister agents.

✦ C. Protective equipment for a radiological attack.
1. Don protective clothing: Basic gear will stop alpha and some beta particles, not gamma rays.
   a. Scrub suit.
   b. Gown and cap.
   c. Mask.
   d. Eye shield.
   e. Double gloves—one pair under cuff of gown and taped to close all entry; second pair can be removed and/or replaced.
   f. Masking tape, 2" wide.
   g. Shoe cover with all seams taped.
   h. Radiation detection device: Able to detect energy emitted from a radiation source. Several detectors available: Geiger counters, dosimeters, etc.
   i. Film badge.
2. If radiation incident is suspected, self-contained breathing apparatus (SCBA) and flash suits are indicated to reduce potential exposure of healthcare providers.
3. If SCBA suits not available:
   a. Use surgical attire or disposable garments (such as those made of Tyvek).
   b. Use eye protection and double gloves.
   c. Use masks with respirators.
4. Triage client's medical condition first, regardless of radiation exposure—first priority is delivery of emergency medical services, including transport.
   a. Administer emergency medical treatment to radiation-exposed clients.
   b. Decontaminate clients who have been contaminated on the scene before transport.
5. Complete decontamination of victims.
   a. Remove client's clothing and have client do a total body wash, scrubbing skin with soap and soft brush.
   b. Place contaminated clothing in bins or biohazard bag labeled "Radioactive."
   c. Capture runoff of water; contain and label "Radioactive."
   d. Wash area down between washing victims to prevent transfer of contaminated material.
   e. Capture material with vacuum cleaner with HEPA filter, if appropriate, to prevent release of radioactive material into the air.
   f. Open wounds or nonintact skin: Irrigate with sterile water or normal saline (NS); cover with dry, sterile dressing.
   g. Eyes: Irrigate with sterile water or NS as directed.
   h. Intact skin: Wash skin with soap and warm water. Bleach, 0.5%, may also be used.
   i. Radiation burns: Treat as other burns are treated.
6. Implement isolation techniques for contaminated victims to confine contamination and protect personnel.
7. Recheck radiation levels at each stage of treatment until reduced to background levels.
8. Dispose of used protective gear appropriately.

## DECONTAMINATION: GENERAL PROTOCOL

✦ **Implementation**

A. Utilize standard precautions for all clients admitted to or arriving at the hospital.
B. Follow routing client placement for normal number of admissions.
   1. Isolate suspicious cases.
   2. Group similar cases.
C. Utilize alternative placement for large numbers of clients.
   1. Co-group clients with similar syndromes in a designated area.
   2. Establish designated unit, floor, or area in advance.

3. Place clients based on pattern of airflow and ventilation with respiratory problems, smallpox, or plague.
4. Place clients after consultation with engineering staff.

D. Control entry to client-designated areas.
E. Transport bioterrorism clients as little as possible—limit to essential movement.
F. Clean, disinfect, and sterilize equipment according to principles of standard precautions.
   1. Use procedures facility has in place for routine cleaning and disinfection.
   2. Have available approved germicidal cleaning solutions.
   3. Contaminated waste should be sorted and disposed of in accordance with biohazard waste regulations.
   4. For clients with bioterrorism-related infections, use standard precautions for cleaning unless infecting organism indicated special cleaning.

**SALVAGEABLE VICTIMS**

- First priority: Decontaminate exposed victims with no symptoms.
- Second priority: Decontaminate exposed victims with minor injuries who require minimal resources.
- Third priority: Decontaminate exposed victims needing maximum medical care.
- Last: Decontaminate deceased victims.

## Decontamination Procedures

### Implementation

✦ A. Decontaminate at scene of incident (hot zone) to prevent hospital system from absorbing contaminated victims and protect healthcare providers and uncontaminated casualties.
✦ B. Familiarize emergency personnel with stages of decontamination.
   1. Gross decontamination.
      a. Decontaminate those who require assistance.
      b. Remove and dispose of exposed victim's clothing. (This will remove 70–80% of contaminant.)
      c. Perform a thorough head-to-toe tepid water rinse. (Cold water can cause hypothermia and hot water can result in vasodilation, speeding distribution of the contaminants.)
   2. Secondary decontamination.
      a. Perform a full-body rinse with clean tepid water. (Water is an effective decontaminant because of rapidity of application.)
      b. Wash rapidly from head to toe with cleaning solution (HTH chlorine is effective) and rinse with water. (HTH chlorine can decontaminate both chemical and biological contaminants.) *Note:* Undiluted household bleach is 5.0% sodium hypochlorite.
   3. Definitive decontamination.
      a. Perform thorough head-to-toe wash and rinse.
      b. Dry victim and don clean clothes.

C. Initial decontamination may be accomplished by the fire department with hoses spraying water at reduced pressure. (This will remove a high percentage of contaminant at an early stage.)
✦ D. Decontaminate salvageable clients first as they are the first priority. (This allows those in need of medical intervention to be treated.)
   ✦ 1. Nonsymptomatic and ambulatory victims are the second priority for decontamination as they have been exposed, yet are salvageable.
   2. Clients who are dead or unsalvageable are third priority for decontamination.
✦ E. Reduce extent of contamination in facility by decontaminating clients prior to receiving in healthcare facility to ensure safety of clients and staff.
   1. Establish decontamination site outside facility using a decontamination tent prior to needing it.
   2. Set up procedures for decontamination, depending on infectious agent.
F. Implement procedure for decontaminating client.
   1. Don appropriate personal protective gear before assisting clients to decontaminate.
   2. Remove decontaminated clothing and place in appropriate double biohazard bags.
   3. Instruct or assist client to shower with soap and water.
   4. Use clean water, normal saline, or ophthalmic solution for rinsing eyes.

**SETTING UP A SITE FOR DECONTAMINATION**

- Establish the decontamination site upwind from contamination area.
- Set up site on a downhill slope, if possible, or on flat ground (so that runoff can be captured).
- Have water source available and, if possible, decontamination solution.
- Have decontamination equipment available, if possible.
- Supply personal protection equipment for healthcare personnel.
- Notify healthcare facilities nearby to be available, if possible.
- Maintain security and privacy for site.
- Institute postdecontamination monitoring and checks.

### Specific Decontamination Steps

✦ **Implementation**

A. Following a biological terrorist event.
   1. Identify dermal exposure, if possible.
   2. Remove victim's clothing as soon as possible and place in biohazard bags.
   3. Cleanse exposed areas using soap and tepid water (large amounts) or diluted sodium hypochlorite (0.5%).
   4. Adhere strictly to standard precautions for emergency personnel to prevent secondary contamination of personnel.
   5. Send victims home, if possible, to continue decontamination procedure.
      a. Instruct to wash thoroughly with soap and water.
      b. Instruct victims to monitor for signs and symptoms of agent.

B. Following a chemical terrorist event.
   1. Know general principles to guide actions following a chemical agent incident.
      a. Expect a 5:1 ratio of unaffected to affected casualties.
      b. Decontaminate immediately (ASAP).
      c. Disrobing is decontamination, head-to-toe; the more removal, the better.
      d. Large volume water flush is best decontamination method.
      e. Following exposure, first responders must decontaminate immediately to avoid serious effects.
   2. Practice triage guidelines for mass casualty decontamination. (Chemical exposure can be deadly, so early decontamination is critical.) Prioritize casualties by identifying those:
      a. Closest to point of release.
      b. Reporting exposure to vapor or aerosol.
      c. With liquid deposits on clothing or skin.
      d. With serious medical conditions.
      e. With conventional injuries.
   3. Decontaminate victims as early as possible. (Requirements differ according to type of chemical agent used: Sarin dissipates quickly in the air; VX remains lethal for hours.)
      a. Nerve agents may be absorbed on all body surfaces—must be removed quickly to be effective.
      b. Vesicant (blister) agents are not always identified due to latent effects.
   4. Treat eyes and mucous membranes with special protocol.
      a. Flush with copious amounts of water.
      b. If available, isotonic bicarbonate (1.26%) or saline (0.9%) may be used as a flushing agent.
   5. Monitor victim for remains of agent or contaminate using chemical agent monitor (CAM) or M8 paper for chemical agents.

C. Following radiation exposure.
   1. Determine cause of incident to identify radiation exposure or contamination. (Exposure does not necessarily indicate need for decontamination.)
      a. First responders may be told by those requesting assistance that there has been a radiation-exposure event.
      b. First responders may recognize radiation exposure from observation at incident site.
   2. Understand difference between exposure and contamination.
      a. Exposed victim: Presents no hazard, requires no special handling, and presents no radiological threat to personnel.
      b. Externally contaminated victim: May mean individual has come in contact with unconfined radioactive material.
   3. Decontaminate all victims; remove all clothing and complete a full body wash.
   4. Institute isolation techniques to confine contamination and protect others.
   5. Decontaminate equipment touched by client.
      a. Gurney used to transfer client.
      b. Equipment used in client care, e.g., BP cuff, stethoscope, etc.
      c. Ambulance.
   6. Decontaminate care providers who touched or moved client (protective clothing may be contaminated).
   7. Examine surrounding area (walls, floor that client may have touched).
   8. Control victims' entry and exit to/from area. (Radioactive particles adhere to dust, may become airborne, and can contaminate other clients and personnel.)

## TRIAGE

**Characteristics**

✦ A. Triage, a French word (trier) meaning "to sort," is a medical process of prioritizing treatment urgency.
   1. The triage system can quickly assess large numbers of people with multiple problems.
   2. Rapid identification determines which clients require immediate treatment and which can safely wait.

**EXAMPLE OF A FIVE-LEVEL TRIAGE SYSTEM: EMERGENCY SEVERITY INDEX (ESI)**

| ESI | Stability of Vital Functions | Life or Organ Threat | Requires Resuscitation | Severe Pain or Distress |
|---|---|---|---|---|
| 1 | Unstable | Obvious | Immediate | Yes |
| 2 | At risk | Fairly Likely | Sometimes | Yes (but not necessary for this category) |
| 3 | Stable | Unlikely (but possible) | Seldom (but possible) | No |
| 4 | Stable | No | No | No |
| 5 | Stable | No | | No |

*Source:* Adapted from McHugh, M., Tanabe, P., McClelland, M., & Khare, R. (2012). More Patients Are Triaged Using the Emergency Severity Index Than Any Other Triage Acuity System in the United States. *Academic Emergency Medicine*. 19(1):106–109. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.1553-2712.2011.01240.x/pdf

**TRIAGE CATEGORIES**

**Field Triage**

| | | |
|---|---|---|
| Red | = | Emergent (hyperacute –1st priority) |
| Yellow | = | Immediate (serious – 2nd priority) |
| Green | = | Urgent (injured – 3rd priority) |
| Blue | = | First aid |
| Black | = | Dead or dying |

**Catastrophic Triage (First Option)**

| | | |
|---|---|---|
| I | = | Immediate (life-threatening) |
| D | = | Delayed (may delay treatment without death) |
| Dead | = | Dead |

**Catastrophic Triage (Second Option)**

| | | |
|---|---|---|
| Red tag | = | Potential to survive |

No other victims tagged.

**START CATEGORIES**

| Color Tag | | | Decontamination Priority |
|---|---|---|---|
| Red tag | = | Immediate | 1. Serious signs/symptoms<br>Known agent contamination |
| Yellow tag | = | Delayed | 2. Moderate-to-minimal signs/symptoms<br>Known agent or aerosol contamination<br>Close to point of release |
| Green tag | = | Minor | 3. Minimal signs/symptoms<br>No known exposure to agent |
| Black tag | = | Deceased/ expectant | 4. Very serious signs/ symptoms<br>Grossly contaminated<br>Unresponsive |

✦ B. The goal of triage is to do the greatest good for the greatest number.
C. From triage, victims are taken to a designated medical treatment area (immediate care, delayed care, or morgue), and from there, transported out of the disaster area.
D. Three-level triage has been used for years to differentiate levels of emergency cases.
E. Now, a five-level system is preferred because it reduces ambiguity of middle-level emergency care.

**Assessment**

A. Assess need to establish triage treatment areas.
B. Validate that public health parameters are established.
C. Observe that steps of triage are followed.
D. Assess that victim is not in immediate danger, or conversely, requires immediate intervention.
E. Assess vital signs of victims.
F. Assess the treatment steps necessary to treat life-threatening conditions.
   1. Observe for signs of respiratory distress.
   2. Assess need for establishing an airway.
   3. Observe for amount and source of bleeding and need for intervention.
   4. Recognize shock state and need for intervention.
G. Assess victims posttriage and observe for any signs or symptoms that indicate major injury.
H. Identify victims having a severe psychological reaction to bioterrorism event.
I. Assess possibility of posttraumatic stress syndrome developing.

✦ **Implementation**

A. Assign roles to personnel in treatment areas.
B. Select a site as soon as possible—advance planning is essential.
   1. Select safe area, free of hazards and debris.
   2. Position site upwind of hazard zone.
   3. Determine site is accessible to transportation vehicles (ambulances, trucks, helicopters).
   4. Be sure site is able to expand.
   5. Survey entire scene, including area above you, for threats to your safety before beginning triage or teamwork.
C. Protect treatment area and delineate area using tarps, covers, etc.
D. Set up signs to identify subdivisions of area.
   I = Immediate care.
   D = Delayed care.
   Dead = Dead for morgue.
   1. Establish I and D areas close together in order to facilitate verbal communication between workers; this also allows them to share medical supplies and transfer victims quickly when status changes.

2. Position victims in head-to-toe configuration, with 2 to 3 feet between victims, facilitating effective use of space and personnel.
3. Establish a secure morgue site that is away (and not visible) from medical treatment areas.

✦ E. Establish public health parameters.
1. Assign personnel to monitor public health concerns where disaster victims are sheltered.
2. Have available search and rescue safety equipment.
3. Maintain proper hygiene by washing hands and using gloves.
   a. Wash hands with soap and water if dirty or antibacterial gel between victims.
   b. Wear gloves at all times.
   c. Change gloves between victims if possible. If not, clean them between victims in a bleach and water solution (1 part bleach to 10 parts water).
4. Wear a mask and goggles.
5. Avoid direct contact with body fluids.
6. Maintain sanitation.
   a. Mark and have available specific biohazard waste disposal containers where bacterial sources (gloves, dressings, etc.) are discarded.
   b. Place waste products in plastic bags and bury them in designated area.
   c. Bury human waste.
7. Purify water for drinking, cooking, medical use, if potable water is not available.
   a. Boil water at rolling boil for 10 minutes.
   b. Use water purification tablets.
   c. Use unscented liquid bleach (16 drops per gallon of water or 1 teaspoon per 5 gallons; mix and let stand for 30 minutes).

✦ F. Steps of trauma assessment applied to triage.
1. Perform a rapid systematic assessment. (Trauma is a multisystem condition so all systems must be assessed.)
2. Complete a primary trauma assessment. (To identify victim's primary and critical problem.)
   a. Airway.
   b. Breathing capability.
   c. Shock—circulation and bleeding.
   d. Neurological—level of consciousness, mental status.
   e. Exposure to contaminant.
   f. Disability.
   g. Evacuation necessity.
3. Complete a secondary assessment (post-triage) that includes a focus assessment.

# DISASTER MANAGEMENT

## Hospital Evacuation Plans

A. Every hospital must have an evacuation plan in place with a designated authority in charge.
B. Types of evacuation.
1. Shelter in place—keeping everyone where they are may be the safest plan.
2. Moving occupants either up (flooding) or down (protection from air attack).
3. Removing all persons from building and relocating to a safe area.

## Communication

### Characteristics

A. Communication systems are likely to be overwhelmed in a disaster.
1. Establishing backup and redundant communication systems is essential.
2. Communication coordination is an important component in the infrastructure system.

B. There must be communication among the triage team (out-of-hospital) for establishing victim care priorities, the hospital or treatment staff (in-hospital), and state and federal agencies.
1. The local communication structure should appoint one community-identified person or small group to be in command and act as liaison agent.
2. The state and federal response teams will be integrated into the communication system.
3. The Incident Command System (ICS) is an example of a local system.
   a. Specific roles and positions carry specific duties and responsibilities.
   b. The ICS tells people how and with whom to communicate.
   c. Each position has a prioritized list of tasks that are checked off as they are completed.
   d. This system organizes emergency responses in five categories: command, planning, operations, logistics, and administration.

✦ C. Hospitals must have an ongoing, open channel of communication with emergency response teams, who will have been notified first of a mass casualty incident.
1. A community-wide network, all using the same channel of communication, is necessary.
   a. A single communication site for obtaining victim and locator information should be established.

b. A clear and open information system, using both telecommunication and a position-to-position cßascade in the event of the primary system being overloaded, is necessary.

2. Adequate equipment, such as cell phones, walkie-talkies, even runners, must be available if current phone land lines are overwhelmed.

**Implementation**

A. Understand lines of communication. (When lines of communication are compromised, effective triage and intervention cannot take place.)
   1. Mass casualty incident occurs.
   2. Local public health official notifies FBI—lead agency for crisis plan.
   3. FBI notifies the Department of Health and Human Services (HHS), the CDC, and Federal Emergency Management Agency (FEMA).
   4. State health agency requests CDC to deploy response teams if needed.

B. Understand the network of communication that will be activated in response to a suspected or actual bioterrorism event.
   1. Emergency response team.
      a. Local and state public health officials.
      b. Infection control personnel in notified facilities.
      c. FBI field offices.
      d. CDC.
      e. Local emergency medical services (EMS).
      f. Local police and fire departments.

   Once the local emergency response system is activated, the local health officer commander is notified first and he/she in turn notifies the FBI field office, HHS, and the CDC.
   2. In turn, the Federal Response Plan will be activated.

C. Activate Federal Response Plan. (When the local area cannot cope with the disaster, federal assistance is available.)
   1. Department of Health and Human Services (HHS) is primary agency.
   2. Office of Emergency Preparedness is action agency.
   3. Emergency Support Function N8 coordinates federal assistance to supplement state and local resources (directed by HHS).
   4. Implemented when state requests assistance and FEMA agrees.

✦ D. Establish a viable communication system.

## TREATING LIFE-THREATENING CONDITIONS

**Implementation**

A. Implement simple triage and rapid treatment (START), the first step for treating multiple casualties in a disaster.

B. Gather all equipment needed for interventions.

✦ 1. Check breathing immediately.
   a. Open airway. (If airway is obstructed, victim cannot get oxygen.)
   b. Move fast—time is critical. (Heart function will be affected within minutes, and brain damage is possible after 4 minutes.)
   c. Check if tongue is obstructing airway. (This is the most common airway obstruction, especially when victim is positioned on back).

2. Use head-tilt/chin-lift method if victim is not breathing and airway is not obstructed.
   a. Touch victim and shout "CAN YOU HEAR ME?"
   b. If victim does not respond, place one hand on forehead, two fingers of other hand under chin, and tilt jaw upward and head back slightly.
   c. Look for chest to rise, listen for air exchange, and feel for abdominal movement.
   d. If no response (victim does not start breathing) repeat procedure. (If AED is available, may apply to victim.)
   e. If victim does not respond after 2nd attempt, move on to next victim. (Goal of disaster intervention is to do the greatest good for the greatest number of victims.)
   f. If the victim begins breathing, maintain airway (hopefully with a volunteer holding airway open) or place soft object under victim's shoulders to elevate them, keeping airway open.

✦ 3. Control bleeding. (If bleeding is not controlled within a short period of time, victim will go into shock—loss of l liter of blood (out of a total of 5 in the human body) will present risk of death.

4. Identify type of bleeding.
   a. Arterial bleeding (spurting blood).
   b. Venous bleeding (flowing blood).
   c. Capillary bleeding (oozing blood).

✦ 5. Choose appropriate method to control bleeding.
   a. Direct local pressure—place direct pressure over wound (using clean or sterile pad) and

press firmly. (About 95% of bleeding can be controlled by direct pressure with elevation.)
   b. Maintain compression by wrapping wound firmly with pressure bandage.
   c. Elevate wound above level of heart.
   d. Use pressure point to slow blood flow to wound, brachial point for arm, femoral point for leg.
✦ 6. Use tourniquet if bleeding cannot be controlled by other methods (consider this a last resort, as tourniquets can pose serious risks to affected limbs).
   a. Incorrect material or application can cause more damage and bleeding; if the tourniquet is too tight, nerves, blood vessels, or muscles may be damaged.
   b. If tourniquet is left in place too long, limb may be lost.
   c. If tourniquet is applied, leave in plain sight and affix label to victim's forehead, stating time tourniquet was applied.
   d. Notify physician to remove tourniquet.
7. Recognize and treat shock.
   a. Body will initially compensate for blood loss, so signs of shock may not be observable.
   b. Continually evaluate victim's condition.
8. Observe for signs/symptoms of shock.
   a. Rapid, shallow breathing (> 30 breaths/minute).
   b. Cold, pale skin (with capillary refill > 2 seconds).
   c. Failure to respond to simple commands.
✦ 9. Administer treatment for shock.
   a. Position victim supine with feet elevated 6–10 inches.
   b. Maintain open airway.
   c. Maintain body temperature (cover ground and victim).
   d. Avoid rough or excessive handling, and do not allow victim to eat or drink.

## POSTTRIAGE INTERVENTIONS

### Assessment

A. Perform head-to-toe assessment, always in the same order. This will enable you to complete it more quickly and accurately: head, neck, shoulders, chest, arms, abdomen, pelvis, legs, back.
B. Complete assessment before beginning any treatment—to prioritize treatment interventions, a complete assessment must be done.
C. Observe for any sign/symptom that indicates major injury.
   1. Assess how person received injury (mechanism of injury).
   2. Airway obstruction.
   3. Signs of shock.
   4. Labored or difficult breathing.
   5. Excessive bleeding.
   6. Swelling/bruising.
   7. Severe pain.

### Implementation

A. Provide immediate treatment. Reclassify victim during treatment, if necessary.
✦ B. Evaluate that victim is not in immediate danger.
   1. If available staff, continue to assess for signs of head, neck, and spinal injury.
      a. Change in level of consciousness (unconscious, confused).
      b. Unable to move body part.
      c. Severe pain in head, neck, back.
      d. Tingling or numbness in extremities.
   2. Continue to assess other signs and symptoms.
      a. Difficulty breathing or seeing.
      b. Heavy bleeding/blood in eyes or nose.
      c. Seizures.
      d. Nausea, vomiting.
C. Immobilize head, neck, or spine by keeping spine in straight line, putting cervical collar on neck, or placing victim on board—if equipment is available.
D. Document person's identity and relevant medical information.
✦ E. Care for those who died.
   1. Victims pronounced DOA (dead on arrival) must be tagged.
      a. Add special tag "not to remove personal effects."
      b. Incorporate special instructions for people performing autopsies, preparing bodies for burial or transportation.
   2. Place bodies in cordoned off area for field triage. (Decontamination may have to be completed before transport.)
   3. Notify those performing postmortem care of victim's diagnosis to protect staff handling postmortem care.
      a. Autopsies performed carefully using all personal protective equipment and standard precautions, including use of masks and eye protection.
      b. Incorporate any special instructions about biological–chemical–radiological agent present.
   4. Complete a record for all bodies including identification, name of person declaring death, diagnosis, if known, name of agency removing body, etc.
✦ F. Care for clients with psychological reactions.
   1. Expect major psychological reactions of fear, panic, anger, horror, paranoia, etc., following a bioterrorism event.

2. Plan prior to such an event for professional and educated volunteers to be on site.
3. Minimize fear and panic in staff.
   a. Provide educational materials that include risks to healthcare workers, accurate information on bioterrorism facts, plans for protecting workers, and use of personal protection equipment.
   b. Encourage team participation in disaster drills, as experience in handling a disaster will build confidence and allay anxiety.
4. Cope with psychological reactions of fear and anxiety.
   a. Minimize panic by clearly explaining the care given.
   b. Offer rapid evaluation and treatment and avoid isolation, if possible.

✦ 5. Treat major anxiety reactions in unexposed persons with factual information, reassurance, and medication, if indicated. (Anxiety is communicable; prompt intervention will allay group anxiety. "Worried well" persons could overwhelm hospitals if they leave area and go to closest healthcare facility.)

6. Prevent postterrorism trauma.
   a. Gather victims into a group with a skilled therapist soon after event (within 24 hours) to prevent a major posttrauma reaction.
      (1) Early opportunity for catharsis will help prevent suppression of traumatic event emotions.
      (2) Group victims according to age and experience.
   b. Follow initial group meeting with subsequent meeting within 1 week to discuss feelings about event. (Research has found that group meetings following traumatic event has eliminated 80% of posttraumatic stress disorder.)

G. Identifying posttraumatic stress disorder.
1. Recognize possibility of existing condition.
   a. Traumatic event occurs and is reexperienced as flashbacks, dreams, or memory state.
   b. Abreaction occurs: vivid recall of painful experience with original emotions.
   c. Individual cannot adjust to event.
2. Assess signs and symptoms of anxiety and depression.
   a. Emotional instability, withdrawal, and isolation.
   b. Nightmares, difficulty sleeping.
   c. Feelings of detachment or guilt.
3. Assess aggressive or acting-out behavior; may be explosive or impulsive behavior.
4. Assist client to go through recovery process.
   a. Recovery: Reassure client that he is safe following experience of the traumatic event.
   b. Avoidance: Client will avoid thinking about traumatic event; support client.
   c. Reconsideration: Client deals with event by confronting it, talking about it, and working through feelings.
   d. Adjustment: Client rehabilitates and adjusts to environment following event; client functions well and is able to view future positively.

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# DISASTER NURSING: BIOTERRORISM REVIEW QUESTIONS

**1.** You are assigned to complete mass-casualty decontamination. Which group, according to triage guidelines, will be decontaminated *last*?

1. Those closest to the point of release of the toxin.
2. Those that have serious medical conditions.
3. Those with liquid deposits on their skin.
4. Those with conventional injuries.

**2.** If a disaster occurs, one example of how the disaster will impact the infrastructure of a city is by the effect it will have on the

1. People who live in the city.
2. Houses and land of the city.
3. Water supply of a city.
4. First responders.

**3.** A preparedness plan for a community-wide communication network includes the local emergency response system being activated. The individual person or agency who is notified *first* would be the

1. Local health officer commander.
2. FBI field office.
3. Department of Health and Human Services.
4. Centers for Disease Control and Prevention (CDC).

**4.** Healthcare workers' exposure to radiation is measured by an instrument readout in units of rads (R). A reading of 50 R tells the worker that if he stays in the exposed area 1 hour, he will receive a rad exposure of

1. 50 rad.
2. 5 rad.
3. 0.75 rad.
4. 100 rad.

**5.** You are assigned to decontaminate casualties. Which decontamination material will you use as a *first* step?

1. Bleach.
2. Hydrogen peroxide.
3. Tepid water.
4. Hot water.

**6.** Which piece of equipment is *not* necessary when implementing standard precautions?

1. Soap or waterless antiseptic.
2. Gloves.
3. Gown.
4. Shoe covers.

**7.** You are assigned to administer smallpox vaccinations to a group of people. Of the following groups, which group would be appropriate to receive the vaccination?

1. Those with immunodeficiency, such as HIV infection or AIDS.
2. Those who have life-threatening allergies to antibiotics.
3. Those with flu, cold, or bronchitis.
4. Those who have been diagnosed with eczema.

**8.** When establishing a triage site following a major disaster, the area that will *not* be included is

1. Immediate care.
2. Intermediate care.
3. Delayed care.
4. The morgue or other designated area for the deceased.

**9.** There is a suspected attack of anthrax. The precautions necessary to implement are

1. Strict isolation.
2. Isolation.
3. Droplet precautions.
4. Standard precautions.

**10.** The precaution protocol necessary to implement for the biohazard of pneumonic plague is

1. Standard precautions plus droplet.
2. Strict isolation with standard precautions.
3. Droplet precautions.
4. Contact precautions.

**11.** The best rationale for informing clients about the smallpox vaccination process is to

1. Avoid a later lawsuit.
2. Meet government expectations.
3. Provide safety information.
4. Make clients comfortable in signing the permission form.

**12.** The most toxic of all chemical agents is/are

1. Cyanide.
2. Vesicant.
3. Pulmonary.
4. Nerve.

**13.** The rationale for setting up a decontamination unit for radiological exposure prior to victims entering the hospital is

1. That it is closer to medical care than a unit in the field.
2. To prevent contamination of clients and healthcare workers.
3. That it is preferable to decontamination at the site.
4. Protection for healthcare workers is better closer to the hospital.

**14.** If a mass-casualty incident occurs and first responders do *not* know what type of personal protection gear is needed, the team should

1. Wait until the type of equipment needed is known.
2. Decontaminate victims before intervening.
3. Choose the highest level of equipment available—full Level A protection.
4. Wear a radiation and biological device before entering the area.

**15.** Place in order the steps for treating life-threatening conditions. _____

1. Control bleeding.
2. Treat shock.
3. Check breathing.
4. Use head-tilt method if airway is obstructed.

# DISASTER NURSING: BIOTERRORISM ANSWERS WITH RATIONALE

1. (4) When triaging casualties, you will first triage serious medical conditions, then those close to the point of release with liquid on their skin or those who report exposure to the agent; you will then treat those with conventional injuries. Last, you would treat those who do not have a serious medical condition.

   **NP:P; CN:S; CA:M; CL:AN**

2. (3) The infrastructure of a city includes transportation, electrical equipment, telephone connections, fuel supplies, and water. People and housing are not part of the infrastructure. Water could be affected by disruption of service, inadequate supply to fight a fire, and increased risk to public health if the supply is not pure.

   **NP:AN; CN:H; CA:M; CL:C**

3. (1) Once the local emergency response system is activated, the local health officer commander (who has been prechosen) is notified first, and he/she in turn notifies the FBI field office, HHS, and the CDC.

   **NP:A; CN:H; CA:M; CL:K**

4. (1) One hour is equal to an exposure of 50 rad. Gray is also a unit of exposure; so the worker should know that if he receives less than 0.75 Gy (when 1 Gray equals 100 rad), his exposure will be in the safe range.

   **NP:E; CN:S; CA:M; CL:C**

5. (3) The primary decontamination material used is tepid water. Water is an effective decontaminant because of the rapidity of application. Water should be tepid because cold water can cause hypothermia and hot water will cause vasodilation, speeding distribution of the contaminants.

   **NP:P; CN:H; CA:M; CL:A**

6. (4) Shoe covers are not considered standard equipment for precautions, but a mask and eye or face shield are included.

   **NP:P; CN:S; CA:M; CL:A**

7. (3) Persons who have a cold, flu, or bronchitis could receive a smallpox vaccination. Other categories of conditions that are excluded (in addition to the ones mentioned in the question) are cardiac conditions, leukemia, lymphoma, pregnancy, or burns.

   **NP:P; CN:H; CA:M; CL:AN**

8. (2) Triage sites will be set up in three areas. The area that is not included is intermediate care. Following a disaster, the area sites are simple and straightforward—those who need immediate care, delayed care, or no care (dead).

   **NP:P; CN:H; CA:M; CL:C**

9. (4) An attack of anthrax would require standard precautions. Isolation is not necessary because anthrax is not transmitted via droplet or person to person.

   **NP:I; CN:S; CA:M; CL:A**

10. (1) Precautions include standard precautions plus droplet precautions (eye protection and surgical mask) until 48–72 hours after antibiotic treatment.

    **NP:I; CN:S; CA:M; CL:A**

11. (3) The best rationale for providing information is the safety element, so the client will know how to recognize side effects, care for the blister, and not contaminate others. Regulations state that clients cannot sue following a vaccination. The government has specific regulations about vaccination being voluntary, rather than a government expectation. A permission form must be signed and adequate information would make the client more comfortable, but it is not a safety issue.

    **NP:E; CN:S; CA:M; CL:C**

12. (4) The most toxic chemical agents are nerve agents, such as sarin, tabon, soman, GF, and VX. These agents

Coding for Questions/Answers Abbreviations: Nursing Process: NP, Assessment: A, Analysis: AN, Planning: P, Implementation: I, Evaluation: E; Client Needs: CN, Safe, Effective Care Environment: S, Health Promotion and Maintenance: H, Psychosocial Integrity: PS, Physiological Integrity: PH; Clinical Area: CA, Medical Nursing: M, Surgical Nursing: S, Maternal/Newborn Nursing: MA, Pediatric Nursing: P, Psychiatric Nursing: PS; Cognitive Level: CL, Knowledge: K, Comprehension: C, Application: A, Analysis: AN.

block acetylcholinesterase, which regulates activity in organs, glands, muscles, and the CNS. With no ability to "turn off," the body wears out and death occurs in a short time.

**NP:AN; CN:S; CA:M; CL:C**

13. (2) It is preferable to decontaminate at the site of radiological exposure, but if it cannot be done, the next choice is to decontaminate prior to entering the hospital to prevent contamination of clients and workers.

**NP:P; CN:H; CA:M; CL:C**

14. (3) Because it is critical that the response team be fully protected, they must wear the highest level of equipment; this includes SCBA full protection suit, shoe covers, double gloves, and biological detection device, if available.

**NP:P; CN:S; CA:M; CL:AN**

**15.** The answer is *3 4 1 2*. After gathering equipment, check breathing. If the victim is not breathing or airway is obstructed, use head-tilt/chin-lift method. Next, you would control bleeding, followed by treating shock.

**NP:I; CN:H; CA:M; CL:C**