

Communicable Diseases, Disasters, and Bioterrorism

Large-scale events have highlighted the need for health care professionals to have knowledge of communicable disease, disaster management, and bioterrorism. Communicable disease is an international health concern.

Nurses have unique skills required to plan for and respond to natural and man-made disasters.

Communicable diseases

- Worldwide, communicable diseases are responsible for the deaths of millions each year.
- Leading causes of communicable disease deaths include acute respiratory infections (including pneumonia and influenza), HIV/AIDS, diarrheal diseases, tuberculosis, malaria, and measles.
- Other diseases that pose a significant threat to community health include viral hepatitis and sexually transmitted infections. Further information about specific communicable diseases can be found in the *Adult Medical Surgical*, *Maternal Newborn*, and *Nursing Care of Children* Review Modules.
- Community health nurses must maintain knowledge of disease rates, modes of transmission, incubation, early manifestations, periods of communicability, and how to intervene at all levels of prevention related to communicable disease.
- The Centers for Disease Control and Prevention (CDC) recommend routine immunizations according to age. Recommendations include schedules/guidelines for children, adolescents, and adults. A “catch up” schedule and recommendations for health care personnel are also available. The CDC website (www.cdc.gov) provides a high-quality resource for the most current information regarding immunization guidelines. 

POPULATIONS AT RISK

- Young children
- Older adults
- Immunosuppressed clients
- Clients who have a high-risk lifestyle
- International travelers
- Health care workers

MODES OF TRANSMISSION

Airborne: inhaled by a susceptible host

- Measles
- Chickenpox
- Tuberculosis (pulmonary or laryngeal)
- Pertussis
- Influenza
- Severe acute respiratory syndrome (SARS)

Foodborne

- **Food infection** (bacterial, viral, parasitic infection of food)
 - Norovirus
 - Salmonellosis
 - Hepatitis A
 - Trichinosis
 - *Escherichia coli* (*E. coli*)
- **Food intoxication** (toxins produced through bacterial growth, chemical contamination, or disease-producing substances)
 - *Staphylococcus aureus*
 - *Clostridium botulinum*

Waterborne: fecal contamination of water

- Cholera
- Typhoid fever
- Bacillary dysentery
- *Giardia lamblia*

Vector-borne: via a carrier such as a mosquito or tick

- West Nile virus
- Lyme disease
- Rocky Mountain spotted fever
- Malaria

Direct contact: transmission of infectious agent from infected host to susceptible host via direct contact

- Sexually transmitted infections: HIV/AIDS, chlamydia, gonorrhea, syphilis, human papilloma virus (HPV), genital herpes, hepatitis B, C, D
- Infectious mononucleosis
- Enterobiasis (pinworms)
- Impetigo
- Lice, scabies

PORTALS OF ENTRY

- Respiratory passages
- Gastrointestinal tract
- Skin
- Mucous membranes
- Genitourinary tract
- Eyes
- Blood vessels

PORTALS OF EXIT

- Respiratory secretions
- Feces
- Blood
- Semen
- Vaginal secretions
- Saliva and emesis
- Skin lesion exudates

DEFENSE MECHANISMS

Herd immunity: Protection due to the immunity of most community members making exposure unlikely

Natural immunity: Natural defense mechanisms of the body to resist specific antigens or toxins

Acquired immunity: Develops through actual exposure to the infectious agent

- **Active:** Production of antibodies by the body in response to infection or immunization with a specific antigen
- **Passive:** Transfer of antibodies to the host either transplacentally from mother to newborn, or through transfusions of immunoglobulins, plasma proteins, or antitoxins

PREVENTION AND CONTROL

- Prevention and control of communicable disease helps eliminate a disease from a specific location, or completely eradicates the existence of a particular disease.
- Nurses can create community programs that monitor individuals' adherence to treatment regimens to help minimize the spread of disease. This strategy also reduces the risk of complications for individuals, which can reduce the overall burden of disease on a community.
- Public health nurses can use the core functions to target communicable disease. For example, a nurse can identify cases of a disease (assessment), develop a program for city or county government to spray insecticide (policy development), and ensure proper follow-up for individuals who have tuberculin skin testing (assurance).

COMMUNICABLE DISEASE SURVEILLANCE

- The community health nurse engages in communicable disease surveillance, which includes the systematic collection and analysis of data regarding infectious diseases.
- Descriptive epidemiology is used to investigate disease patterns to identify whom it affected, where the issue is located, how it occurs, why or what the cause is, and when the condition started.
- Information gained from monitoring disease patterns can help identify an unusual disease outbreak or newly emerging disease (public health assessment). The data is also useful in developing public health policies regarding disease management, and to evaluate efficiency of communicable disease programs (assurance).
- Community health nurses can use disease surveillance to track the point of origin of some diseases. For example, the disease can be spread from a common individual or community (host) or a contaminated food or water source (environment).
- Surveillance also helps management of a disease outbreak.
- Reporting of communicable diseases is mandated by state and local regulations, and state notification to the CDC is voluntary.

NATIONALLY NOTIFIABLE DISEASES

Identified at www.cdc.gov and include the following. 

- Anthrax
- Botulism
- Cholera
- Congenital rubella syndrome (CRS)
- Diphtheria
- Giardiasis
- Gonorrhea
- Hepatitis A, B, C
- HIV infection
- Influenza-associated pediatric mortality
- Legionellosis/Legionnaires' disease
- Lyme disease
- Malaria
- Meningococcal disease
- Mumps
- Pertussis (whooping cough)
- Poliomyelitis, paralytic
- Poliovirus infection, nonparalytic
- Rabies (human or animal)
- Rubella (German measles)
- Salmonellosis
- Severe acute respiratory syndrome-associated coronavirus disease (SARS-CoV)
- Shigellosis
- Smallpox
- Syphilis
- Tetanus/*C. tetani*
- Toxic shock syndrome (TSS) (other than Streptococcal)
- Tuberculosis (TB)
- Typhoid fever
- Vancomycin-intermediate and vancomycin-resistant *Staphylococcus aureus* (VISA/VRSA)

HEALTH CARE GOALS

Regarding the control of communicable diseases

REDUCTIONS IN

- Infections caused by pathogens often transmitted through food
- New HIV diagnoses among adolescents and adults
- New AIDS cases among adolescents and adults
- Number of perinatally acquired HIV and AIDS cases
- Deaths from HIV infection
- Vaccine-preventable diseases (reduction or elimination)
- Number of antibiotic courses for ear infections in young children

INCREASES IN

- Consumers who follow food safety practices
- Surviving more than 3 years after a diagnosis of AIDS
- Adolescents and adults who have been tested for HIV in the past 12 months
- Testing for HIV in adults who have TB
- Substance use treatment facilities that offer HIV/AIDS education, counseling, and support
- Sexually active persons who use condoms
- Immunization rates among young children
- Immunization rates among adolescents
- Annual seasonal influenza immunizations among children and adults
- Adults who are immunized against pneumococcal disease
- Adults who are immunized against herpes zoster (shingles)
- Tuberculosis clients who complete therapy

IMMUNIZATION

- The community health nurse plays a major role in increasing immunization coverage to reduce the spread of vaccine-preventable diseases.
- Immunizations are often administered in community health settings, such as public health departments.
- The community health nurse often tracks immunization schedules of at-risk populations, such as children, older adults, immunosuppressed individuals, and health care workers. ☺
- The community health nurse must educate the community about the importance of immunizations.
- The community health nurse must stay up to date on current immunization schedule recommendations and appropriate precautions when administering immunizations.

LEVELS OF PREVENTION

PRIMARY PREVENTION

- Prevent the occurrence of infectious disease.
- Educate the public regarding the need for immunizations, and federal and state immunization programs.
- Counsel clients traveling to other countries about protection from infectious diseases. Refer clients to the health department for information about mandatory immunizations.
- Educate the public regarding prevention of disease and ways to eliminate risk factors for exposure, such as hand hygiene, universal precautions, proper food handling and storage, use of insecticides, and use of condoms.

SECONDARY PREVENTION

- Increase early detection through screening and case finding.
- Refer suspected cases of communicable disease for diagnostic confirmation and epidemiologic reporting.
- Provide post-exposure prophylaxis (hepatitis A, rabies).
- Quarantine clients when necessary.
- Use partner notification and contact tracing to identify and screen individuals who have been exposed to a communicable disease. Qs

TERTIARY PREVENTION

- Decrease complications and disabilities due to infectious diseases through treatment and rehabilitation.
- Monitor treatment compliance, including directly observed therapy (DOT).
- Identify and link clients to needed community resources.

Disasters

A disaster is an event that causes human suffering and demands more resources than are available in the community. A disaster can be naturally occurring, man-made, or a combination of both, such as a natural disaster causing technological failures.

LEVELS OF DISASTER MANAGEMENT

DISASTER PREVENTION (MITIGATION)

- Includes activities to prevent natural and man-made disasters, such as increasing surveillance, improving inspections and airport security, and strengthening public health processes such as immunizations, isolation, and quarantine.
- Activities such as strengthening levees/barriers to prevent flooding and teaching methods of preventing communicable disease transmission are also components.
- The community's threats, vulnerabilities, and capabilities are determined, as are the demographics of community members.
- This level also includes identification and assessment of populations at risk. ☺
 - Populations at risk are those that have fewer resources or less of an ability to withstand and survive a disaster without physical harm.
 - These populations tend to be physically isolated, disabled, or unable to access disaster services. Strategic emergency planning is necessary to prevent the loss of lives in susceptible populations.

DISASTER PREPAREDNESS Qs

- Disaster preparedness occurs at the national, state, and local levels. Personal and family preparedness are crucial components of disaster preparedness, as is professional preparedness for individuals employed in civil service and health care.
- Disaster preparations should stem from threats and vulnerabilities identified in the prevention level, and should coordinate community efforts as well as outline specific roles of local agencies.
- This level of management includes preparedness for natural or man-made disasters.
- Individual and family disaster preparedness include creating an action plan and determining alternative methods of communication, highlighting possible evacuation routes, identifying local and distant meeting places, and creating a disaster kit.
- Setting up a communication protocol is an important part of community disaster planning. The communication plan should provide for access to emergency agencies, such as the American Red Cross, and state and federal government agencies. QTC
- Disaster drills replicate possible scenarios in the local area and enhance preparedness of community members, government agencies, health care facilities, and businesses.

DISASTER RESPONSE

- Different agencies, governmental and nongovernmental, are responsible for different levels of disaster response. Some of the agencies with a role in disaster response include the Federal Emergency Management Agency (FEMA), the CDC, U.S. Department of Homeland Security (DHS), American Red Cross (ARC), Office of Emergency Management (OEM), and the public health system.
- Disaster management response includes an initial assessment of the span of the disaster.
 - How many people are affected?
 - How many are injured or dead?
 - How much fresh water and food is available?
 - What are the areas of risk or sanitation problems?
- Disasters are classified according to type, level, and scope.
- If a federal emergency is declared, the National Response Framework (NRF) is activated and provides direction for an organized, effective national response.

DISASTER RECOVERY

- Recovery begins when danger no longer exists and needed representatives and agencies are available to assist with rebuilding.
- Recovery lasts until the economic and civil life of the community are restored, which can be days, weeks, or even years. At an individual level, it is the time it takes an individual to become functional within a community after a disaster.
- Communicable disease and sanitation controls are important aspects of disaster recovery.
- Post-traumatic stress disorder (PTSD) and delayed stress reactions (DSR) are common during the aftermath of disasters and can affect both caregivers and victims.

PHASES OF EMOTIONAL REACTION DURING A DISASTER

- **Heroic:** Intense excitement and concern for survival. Often a rush of assistance from outside the area is present.
- **Honeymoon:** Affected individuals begin to bond and relive their experiences.
- **Disillusionment:** Responders can experience depression and exhaustion. Phase contains unexpected delays in receiving aid.
- **Reconstruction:** Involves adjusting to a new reality and continued rebuilding of the area. Counseling is sometimes needed. Those affected begin looking ahead.

ROLES OF COMMUNITY HEALTH NURSES

RISK ASSESSMENT

Asking the following questions Qs

- What are the populations at risk within the community?
- Have there been previous disasters, natural or man-made?
- What size of an area or population is likely to be affected in a worst-case scenario?
- What is the community disaster plan?
- What kind of warning system is in place?
- What types of disaster response teams (volunteers, nurses, health care providers, emergency medical technicians, firemen) are in place?
- What kinds of resource facilities (hospitals, shelters, churches, food-storage facilities) are available in the event of a disaster?
- What type of evacuation measures (boat, motor vehicle, train) will be needed?
- What type of environmental dangers (chemical plants, sewage displacement) can be involved?

DISASTER PLANNING

- Develop a disaster response plan based on the most probable disaster threats.
- Identify the community disaster warning system and communication center, and learning how to access it.
- Identify the community's first responders' disaster plan.
- Make a list of agencies that are available for the varying levels of disaster management at the local, state, and national levels.
- Define the nursing roles in first-, second-, and third-level triage.
- Identify the specific roles of personnel involved in disaster response and the chain of command.
- Locate all equipment and supplies needed for disaster management, including hazmat suits, infectious control items, medical supplies, food, and potable (drinkable) water. Detail a plan to replenish these regularly.
- Check equipment (including evacuation vehicles) regularly to ensure proper operation.
- Evaluate the efficiency, response time, and safety of disaster drills, mass casualty drills, and disaster plans.

DISASTER RESPONSE

- Activate the disaster management plan.
- Perform triage and direct those affected, coordinating evacuation, quarantine, and opening of shelters.
- Triage involves identifying those who have serious versus minor injuries, prioritizing care of victims, and transferring those requiring immediate attention to medical facilities.

DISASTER RECOVERY

- Make home visits and reassess the health care needs of the affected population.
- Provide and coordinate care in shelters.
- Provide stress counseling and assessing for PTSD or delayed stress reactions, and making referrals for psychological treatment.

EVALUATION OF DISASTER RESPONSE

- Evaluate the area, effect, and level of the disaster.
- Create ongoing assessment and surveillance reports.
- Evaluate the efficiency of the disaster response teams.
- Estimate the length of time for recovery of community services, such as electricity and running potable water.

Bioterrorism

AGENTS OF BIOTERRORISM

CATEGORY A BIOLOGICAL AGENTS

- The highest priority agents, posing a risk to national security because they are easily transmitted and have high mortality rates.
- Examples include smallpox, botulism, anthrax, tularemia, viral hemorrhagic fevers (e.g., Ebola), and plague.

CATEGORY B BIOLOGICAL AGENTS

- The second-highest priority because they are moderately easy to disseminate, and have high morbidity rates and low mortality rates.
- Examples include typhus fever, ricin toxin, diarrheagenic *E. coli*, and West Nile virus.

CATEGORY C BIOLOGICAL AGENTS

- The third-highest priority, comprising emerging pathogens that can be engineered for mass dissemination because they are easy to produce, and/or have a potential for high morbidity and mortality rates.
- Examples include hantavirus, influenza virus, tuberculosis, and rabies virus.

BIOTERRORISM INCIDENTS

Inhalational anthrax

MANIFESTATIONS

- Headache
- Fever and chills
- Muscle aches
- Chest discomfort
- Severe dyspnea
- Shock

PREVENTION

- Anthrax vaccine for those at high-risk for exposure to anthrax.
- Ciprofloxacin and doxycycline are recommended by the CDC for prevention of anthrax following exposure.

TREATMENT: Antitoxin and IV antibiotics are administered if manifestations of an anthrax infection are present.

Botulism

MANIFESTATIONS

- Double or blurred vision
- Slurred speech
- Difficulty swallowing
- Progressive muscle weakness
- Difficulty breathing

PREVENTION: No approved vaccine

TREATMENT

- Airway management with possible mechanical ventilation
- Administration of antitoxin

ELIMINATION OF TOXIN: Induction of vomiting, enemas, surgical excision of wound tissue

SUPPORTIVE CARE: Nutrition, fluids, prevent complications

Smallpox

MANIFESTATIONS

- High fever
- Fatigue
- Head and body aches
- Rash that begins on face and tongue; quickly spreads to the trunk, arms, and legs, then hands and feet; then turns to pus-filled lesions
- Vomiting

PREVENTION

- Vaccine for those at high-risk (provides 10 years of immunity); can vaccinate within 3 days of exposure
- Contact and airborne precautions

TREATMENT: No cure

SUPPORTIVE CARE: Hydration, pain medication, antipyretics, antibiotics for secondary infections

Ebola

MANIFESTATIONS

- Fever
- Severe headache
- Joint and muscle aches
- Fatigue and weakness
- Hemorrhage
- Vomiting and diarrhea
- Shock

PREVENTION

- No approved vaccine available
- Don impermeable gown or coverall; disposable gloves (two pairs), boot covers, and apron; and N95 mask. Recommend a second caregiver supervise doffing. Maintain droplet isolation precautions.

TREATMENT

- Supportive care IV fluids, dialysis, airway management, psychological counseling.
- Minimize invasive procedures.

Plague

MANIFESTATIONS

These forms can occur separately or in combination.

- **Pneumonic plague:** fever, headache, weakness, pneumonia with shortness of breath, chest pain, cough, and bloody or watery sputum
- **Bubonic plague:** swollen, tender lymph nodes, fever, headache, chills, and weakness
- **Septicemic plague:** fever, chills, weakness, prostration, abdominal pain, shock, disseminated intravascular coagulation (DIC), gangrene of nose and digits

PREVENTION

- Vaccine no longer available in the U.S.
- Contact precautions till decontaminated
- Droplet precautions till 72 hr after antibiotics

TREATMENT: Gentamicin and fluoroquinolones

Tularemia

MANIFESTATIONS

- Sudden fever, chills, headache, diarrhea, muscle aches, joint pain, dry cough, progressive weakness
- If airborne, life-threatening pneumonia and systemic infection

PREVENTION: Vaccine under review by the Food and Drug Administration but not currently available

TREATMENT

- Streptomycin or gentamicin is the antibiotic of choice.
- In mass causality, use doxycycline or ciprofloxacin.

DELIVERY MECHANISMS FOR BIOLOGICAL AGENTS

- Direct contact (subcutaneous anthrax)
- Simple dispersal device (airborne, nuclear)
- Water and food contamination
- Droplet or blood contact

ROLE OF THE COMMUNITY HEALTH NURSE

- Participate in planning and preparation for immediate response to a bioterrorism event.
- Identify potential biological agents for bioterrorism.
- Survey for and report bioterrorism activity (usually to the local health department).
- Promptly participate in measures to contain and control the spread of infections resulting from bioterrorism activity.

ASSESSMENT OF THREAT Qs

- Is the population at risk for sudden high disease rates?
- Is the vector that normally carries a specific disease available in the geographical area affected?
- Is there a potential delivery system within the community?

RECOGNITION OF A BIOTERRORISM EVENT

- Is there a rapidly increasing disease incidence in a normally healthy population?
- Is a disease occurring that is unusual for the area?
- Is an endemic occurring at an unusual time? For example, is there an outbreak of influenza in the summer?
- Are there large numbers of people dying rapidly with similar presenting manifestations?
- Are there any individuals presenting with unusual manifestations?
- Are there unusual numbers of dead or dying animals, unusual liquids/vapors/odors?

LEVELS OF PREVENTION

PRIMARY PREVENTION: Bioterrorism planning

- Prepare with bioterrorism drills, vaccines, and ensuring availability of antibiotics for exposure prophylaxis.
- Design a bioterrorism response plan using the most probable biological agent in the local area.
- Identify the chain of command for reporting bioterrorism attacks.
- Define the nursing roles in the event of a bioterrorism attack.
- Set up protocols for different levels of infection control and containment.

SECONDARY PREVENTION: Early recognition

- Activate bioterrorism response plan in response to a bioterrorism event.
- Immediately implement infection control and containment measures, including decontamination, environmental disinfection, protective equipment, community education/notification, and quarantines.
- Screen the population for exposure, assessing rates of infection and administering vaccines as available.
- Assist with and educate the population regarding identification of manifestations and management (immunoglobulin, antiviral, antitoxins, and antibiotic therapy, depending on the agent).
- Monitor mortality and morbidity.

TERTIARY PREVENTION: Rehabilitation of survivors

- Monitor medication regimens and referrals.
- Evaluate effectiveness and timeliness of the bioterrorism plan.

Application Exercises

1. A nurse is preparing a community health program on communicable diseases. When discussing modes of transmission, the nurse should include which of the following illnesses as airborne?
 - A. Cholera
 - B. Malaria
 - C. Influenza
 - D. Salmonellosis
2. A home health nurse is discussing portals of entry with a group of newly hired assistive personnel. Which of the following locations should the nurse include as a portal of entry? (Select all that apply.)
 - A. Respiratory secretions
 - B. Skin
 - C. Genitourinary tract
 - D. Saliva
 - E. Mucous membranes
3. A newly hired public health nurse is familiarizing himself with the levels of disaster management. Which of the following actions is a component of disaster prevention?
 - A. Outlining specific roles of community agencies
 - B. Identifying community vulnerabilities
 - C. Prioritizing care of individuals
 - D. Providing stress counseling
4. A community health nurse is educating the public on the agents of bioterrorism. Which of the following agents should the nurse include as Category A biological agents? (Select all that apply.)
 - A. Hantavirus
 - B. Typhus
 - C. Plague
 - D. Tularemia
 - E. Botulism
5. A community health nurse is determining available and needed supplies in the event of a bioterrorism attack. The nurse should be aware that community members exposed to anthrax will need access to which of the following medications?
 - A. Metronidazole
 - B. Ciprofloxacin
 - C. Zanamivir
 - D. Fluconazole

PRACTICE Active Learning Scenario

A community health nurse is responding to a man-made disaster in the local community. Use the ATI Active Learning Template: Basic Concept to complete this item.

UNDERLYING PRINCIPLES

- Include three agencies involved in disaster response.
- List two questions to ask to determine the disaster's scope.

NURSING INTERVENTIONS: Explain four disaster response nursing roles.

Application Exercises Key

- A. Cholera is waterborne illness.
B. Malaria is a vector-borne illness.
C. **CORRECT:** Influenza is an airborne illness.
D. Salmonellosis is a foodborne illness.
N NCLEX® Connection: Safety and Infection Control, Standard Precautions/Transmission-Based Precautions/Surgical Asepsis
- A. Respiratory secretions are a portal of exit.
B. **CORRECT:** Skin is a portal of entry.
C. **CORRECT:** The genitourinary tract is a portal of entry.
D. Saliva is a portal of exit.
E. **CORRECT:** Mucous membranes are a portal of entry.
N NCLEX® Connection: Safety and Infection Control, Standard Precautions/Transmission-Based Precautions/Surgical Asepsis
- A. Outlining specific roles of community agencies is a component of disaster preparedness.
B. **CORRECT:** Identifying community vulnerabilities is a component of disaster prevention.
C. Prioritizing care of individuals is a component of disaster response.
D. Providing stress counseling is a component of disaster recovery.
N NCLEX® Connection: Safety and Infection Control, Emergency Response Plan
- A. Hantavirus is a Category C biological agent.
B. Typhus is a Category B biological agent.
C. **CORRECT:** Plague is a Category A biological agent.
D. **CORRECT:** Tularemia is a Category A biological agent.
E. **CORRECT:** Botulism is a Category A biological agent.
N NCLEX® Connection: Safety and Infection Control, Emergency Response Plan
- A. Metronidazole is used to treat trichomoniasis, skin infections, and septicemia.
B. **CORRECT:** Community members exposed to anthrax will need access to ciprofloxacin. This medication is used for the prophylactic treatment of anthrax.
C. Zanamivir is used to treat influenza.
D. Fluconazole is used to treat candidiasis.
N NCLEX® Connection: Safety and Infection Control, Emergency Response Plan

PRACTICE Answer

Using the ATI Active Learning Template: Basic Concept

UNDERLYING PRINCIPLES

Involved agencies

- FEMA
- CDC
- U.S. Department of Homeland Security
- American Red Cross
- Office of Emergency Management

Disaster scope

- How many people are affected?
- How many are injured or dead?
- How much potable water and food is available?
- What are the areas of risk or sanitation problems?

N NCLEX® Connection: Safety and Infection Control, Emergency Response Plan

NURSING INTERVENTIONS

- Activate the disaster management plan.
- Perform triage and direct disaster victims.
- Identify people who have serious vs. minor injuries.
- Prioritize care of those affected.
- Transfer those requiring immediate attention to medical facilities.
- Coordinate evacuation or quarantines.
- Open shelters.