

ELEMENT II

MODES AND MECHANISMS OF TRANSMISSION OF PATHOGENIC ORGANISMS IN THE HEALTHCARE SETTING AND STRATEGIES FOR PREVENTION AND CONTROL

LEARNING OBJECTIVES

Upon completion of course work or training on this element, the learner will be able to:

- Describe how pathogenic organisms are spread in healthcare settings;
- Identify the factors which influence the outcome of an exposure to pathogenic organisms in healthcare settings;
- List strategies for preventing transmission of pathogenic organisms; and
- Describe how infection control concepts are applied in professional practice.

DEFINITIONS

Pathogen or infectious agent: A biological, physical, or chemical agent capable of causing disease.

Biological agents may be bacteria, viruses, fungi, protozoa, helminthes, or prions.

Portal of entry: The means by which an infectious agent enters the susceptible host.

Portal of exit: The path by which an infectious agent leaves the reservoir.

Reservoir: Place in which an infectious agent can survive but may or may not multiply or cause disease. Healthcare workers may be a reservoir for a number of nosocomial organisms spread in healthcare settings.

Standard precautions: A group of infection prevention and control measures that combine the major features of Universal Precautions and Body Substance Isolation and are based on the principle that all blood, body fluids, secretions, excretions except sweat, nonintact skin, and mucous membranes may contain transmissible infectious agents.

Susceptible host: A person or animal not possessing sufficient resistance to a particular infectious agent to prevent contracting infection or disease when exposed to the agent.

Transmission: Any mechanism by which a pathogen is spread by a source or reservoir to a person.

Common vehicle: Contaminated material, product, or substance that serves as a means of transmission of an infectious agent from a reservoir to one or more susceptible hosts through a suitable portal of entry.

CONTENT OUTLINE

I. Overview of components of the infectious disease process.

A. Concept of "The Chain of Infection":

1. Pathogen or infectious agent;
2. Reservoir (human, animal, environmental);
3. Portal of exit:
 - a. Sites (respiratory tract, gastrointestinal tract, genitourinary tract, skin/mucous membrane, transplacental, blood);
 - b. Mechanisms (drainage, excretions, secretions).
4. Portal of entry:
 - a. Sites (respiratory tract, gastrointestinal tract, genitourinary tract, skin/mucous membrane, transplacental, parenteral);
 - b. Mechanisms (percutaneous injury, invasive devices/procedures (e.g., vascular access), surgical incision).
5. Mode of transmission:
 - a. Contact with pathogen:
 - 1) Direct;
 - 2) Indirect;
 - 3) Droplet;
 - 4) Airborne.
 - b. Common vehicle (e.g., food, water);
 - c. Vectorborne.
6. Susceptible host.

B. Factor influencing the outcome of exposures:

1. Host factors:
 - a. Natural barriers (e.g., intact skin, respiratory cilia, gastric acid and

- motility, flow of urine, tears, normal flora);
- b. Host immunity (e.g., inflammatory response, humoral immunity, cell-mediated immunity, immune memory).
- 2. Pathogen or infectious agent factors:
 - a. Infectivity;
 - b. Pathogenicity;
 - c. Virulence;
 - d. Size of inoculum;
 - e. Route of exposure;
 - f. Duration of exposure.
- 3. Environmental factors:
 - a. Contamination of environment, fomites;
 - b. Contamination of equipment.

II. Methods to prevent the spread of pathogenic organisms in healthcare settings.

A. Standard precautions:

- 1. Respiratory hygiene/cough etiquette;
- 2. Safe injection practices (see Element III);
- 3. Use of masks during spinal/epidural access procedures.

B. For patients infected with organisms other than bloodborne pathogens:

- 1. Early identification;
- 2. Prompt isolation;
- 3. Appropriate treatment.

C. Control of routes of transmission:

1. Hand hygiene:

- a. Appropriate selection and use of agents (e.g., soap and water, alcohol based hand sanitizers);
- b. Factors influencing hand hygiene efficacy;
- c. Sources of potential contamination or cross-contamination of hand hygiene materials.

2. Use of appropriate barriers:

- a. Appropriate selection, donning, doffing, and disposal of personal

protective equipment (PPE).

3. Appropriate isolation/cohorting of patients infected with communicable diseases:
 - a. Standard precautions for all patients;
 - b. Transmission based precautions for other pathogens:
 - 1) Contact (direct, indirect);
 - 2) Droplet;
 - 3) Airborne.
 - c. Host support and protection:
 - 1) Vaccination;
 - 2) Pre-and post-exposure prophylaxis;
 - 3) Protecting skin and immune system integrity.
 - d. Environmental control measures:
 - 1) Cleaning, disinfection, and sterilization of patient care equipment (see Element V);
 - 2) Environmental cleaning (housekeeping);
 - 3) Appropriate ventilation;
 - 4) Waste management;
 - 5) Linen and laundry management;
 - 6) Food services.
 - e. Engineering and work practice controls (see Element III).
 - f. Training and education of healthcare workers.