

Health Care-Associated Infections



Health Care-Associated Infections

Objectives:

At the end of this lecture the student should be able to:

- Define of infection-related terms
- Describe the signs and symptoms of infection
- Discuss chain of infection
- Define nosocomial infection
- Identify predisposing factors in nosocomial infection
- List types of nosocomial infection
- Differentiate between medical and surgical asepsis
- Define terms related to medical and surgical asepsis
- Discuss decontamination of medical equipment
- Discuss standard precautions and transmission based precautions

Outlines:

- Infection-related terms
- Signs and symptoms of infection
- definition of nosocomial infection
- Predisposing factors in nosocomial infection
- Types of nosocomial infection
- Medical and surgical asepsis
- Decontamination of medical equipment
- standard precaution and transmission based precaution

INFECTION

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- ◎ **Infection results** when germs enter the body and establish themselves, multiply and cause some adverse reaction in the patient/client.

Infection

Introduction :

- ◎ **Infection** is a major safety, and health hazard. Some infections are minor and cause short illnesses; others are serious and can cause death. Infections are serious for infants and older patients.

Signs and Symptoms

Definitions

- **Localized infection vs. systemic infection**
 - **Localized Infection**
 - An infection that is restricted to a specific location or region within the body of the host
 - **Systemic Infection**
 - An infection that has spread to several regions or areas in the body of the host

A-Localized effect

- Redness,
- Hot
- Painful
- Swelling,
- Drainage,
- Tenderness
- Restricted movement of part



Generalized effect

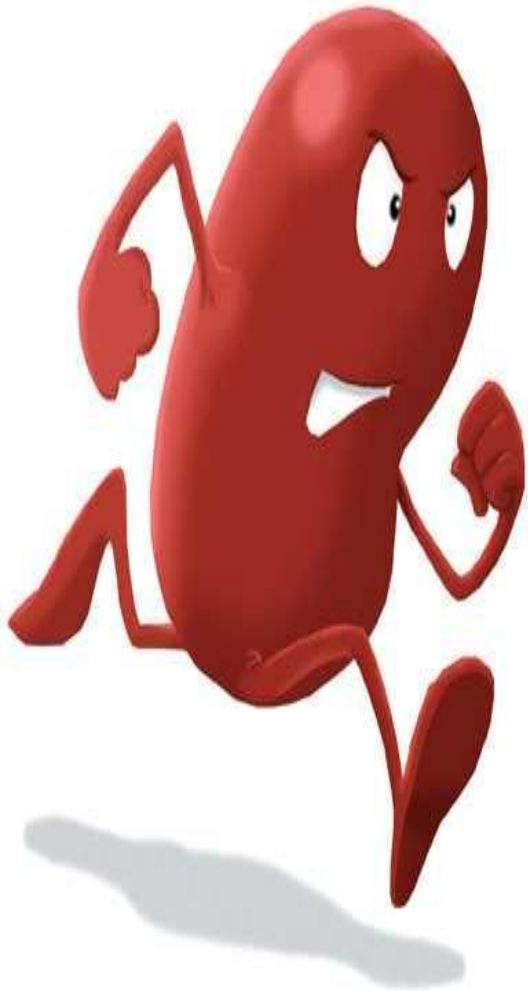
involves the entire body and cause:

- fever,
- chills
- Low blood pressure
- mental changes or confusion
- fatigue,
- malaise,
- in all major lymph nodes become enlarged, swelling, and tender during palpation



- loss of appetite,
- nausea, vomiting,
- decrease urine output,
- Leucocytosis
- Fever lead to tachycardia, tachypnea, and hypotension
- If unrecognized lead to dehydration, acidosis, septic shock then death within short period.

Types of infection:



Modes of spread

Two sources of infection:

- Endogenous or self-infection - organisms which are harmless in one site can be pathogenic when transferred to another site e.g., E. coli
- Exogenous or cross-infection - organisms transmitted from another source e.g., nurse, doctor, other patient, environment (Peto, 1998)

Endogenous infection (self infection)

- It is infection caused by microorganisms which originate from patients themselves .
- **An infection** caused by an infectious agent that is already present in the body, but has previously been inapparent or dormant .

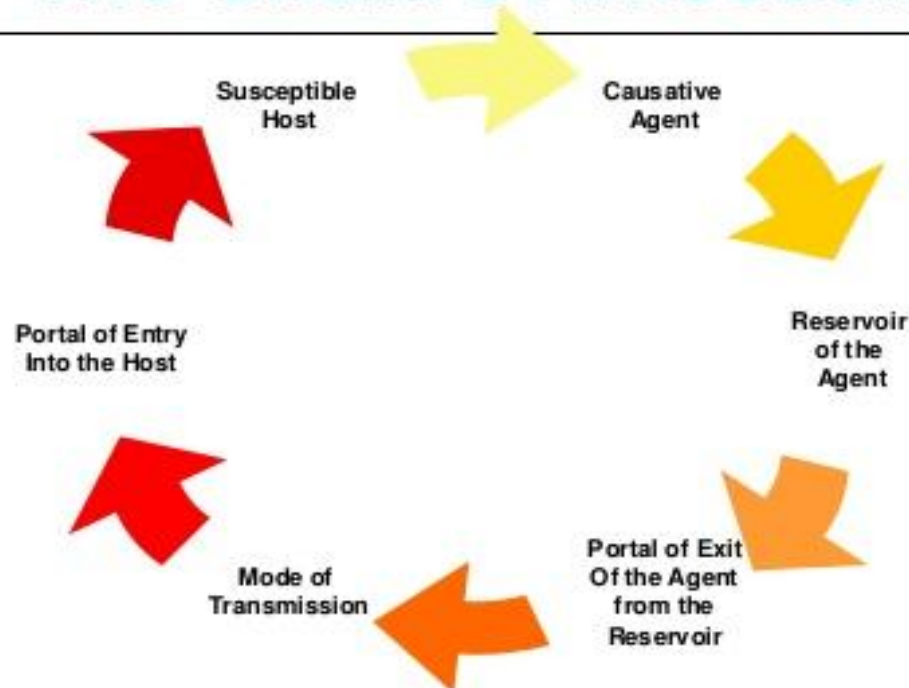
Exogenous infection (Cross infection)

- It is infection caused by the transfer of a microorganism to an individual. This will have originated either from another patient or health care worker or from environment .
- Any hospitalized patient whose normal natural defense to infection is reduced will be particularly vulnerable to exogenous infections .
- More commonly, this may be from member of staff who has failed to wash his hand properly.

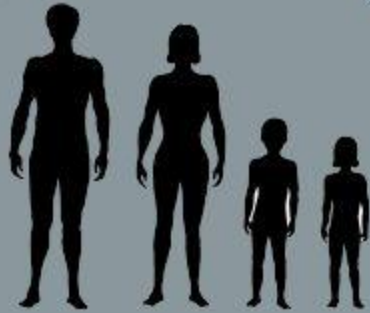
Chain of infection:

- ◎ This process is known as the infection chain, and contains **six** links :

The Chain of Infection



The Chain of Infection



Susceptible Host



Infectious Agent



Reservoir Host



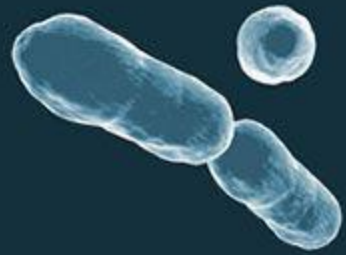
Portal of Entry

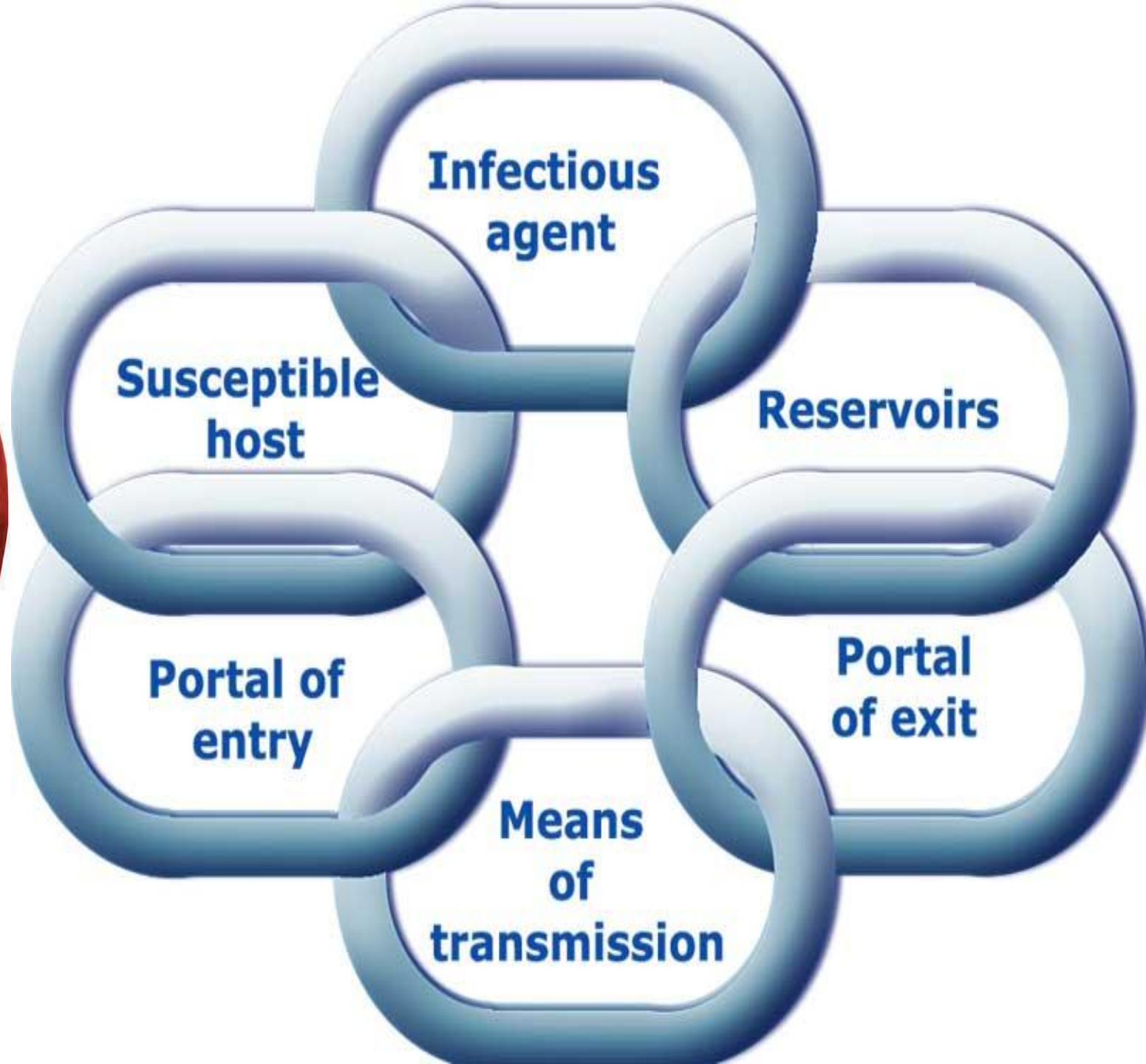
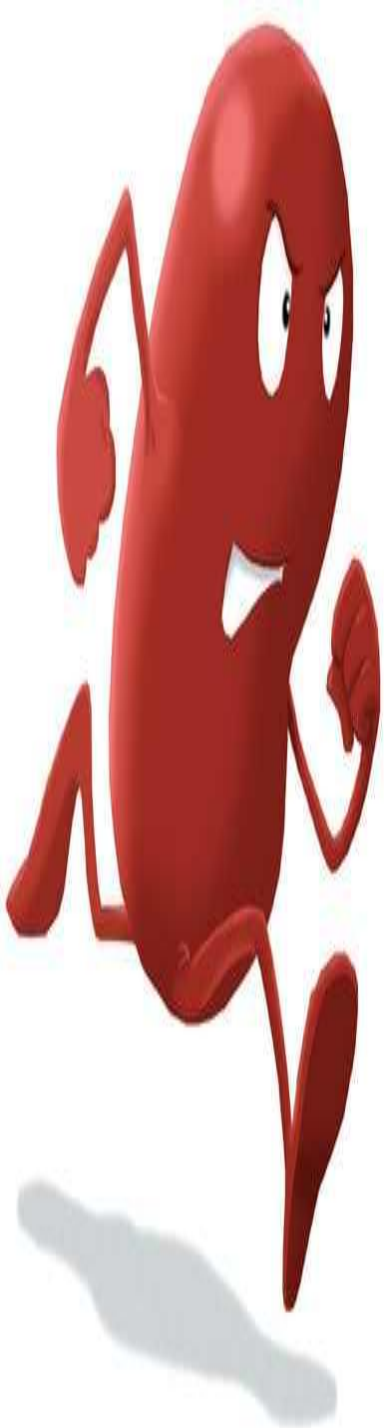


Mode of Transmission



Portal of Exit





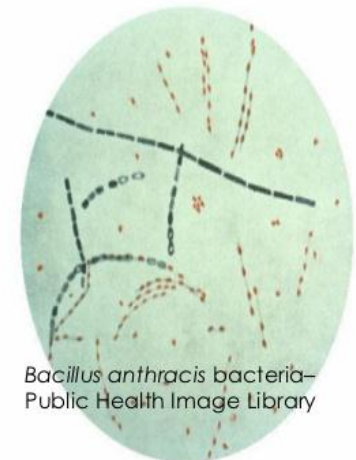
Chain of infection

(1) Infectious agent: Agents that produce infections can consists of bacteria, viruses, fungi, and protozoa.



What Causes an Infectious Disease?

- Infection is caused by microorganism
- The microorganism may be a bacteria, a virus, a parasite or a fungus



Bacillus anthracis bacteria—
Public Health Image Library

2-Reservoir : is a place for organism to live while awaiting a host. Inanimate objects, human being, and animals are sources. The human body is the most common reservoir .

Definitions

- **Reservoir of Infection**
 - The source of an infectious agent
- **Carrier**
 - An individual who carries an infectious agent without manifesting symptoms, yet who can transmit the agent to another individual
- **Fomites**
 - Any inanimate object capable of being an intermediate in the indirect transmission of an infectious agent

RESERVOIR

- **Definition:**
 - place in which an infectious agent can survive but may or may not multiply
- **Common reservoirs**
 - humans
 - animals
 - equipment
 - medication/intravenous fluid



- **Human sources** include other clients, health care personnel, family members, visitors and clients themselves. (Animate sources (humans, animals, insects))



- **Inanimate objects** include medications, air, food, water or any other material on which organism can find nourishment or lie dormant, and survive). Inanimate sources (soil, air, water, food, medication, medical equipment)



- **Pathogens need** a proper environment to survive, **the microbe needs** food, oxygen (if aerobic), a viable temperature range (around 95°F), water, and lack of sunlight.

FACTORS THAT INFLUENCE MICROBIAL GROWTH

- **Following factors influence microbial growth:**
 - **Temperature**
 - **pH, or the values used in chemistry to express the degrees of acidity or alkalinity of a substance**
 - **Darkness**
 - **Food**
 - **Moisture**
 - **Oxygen**

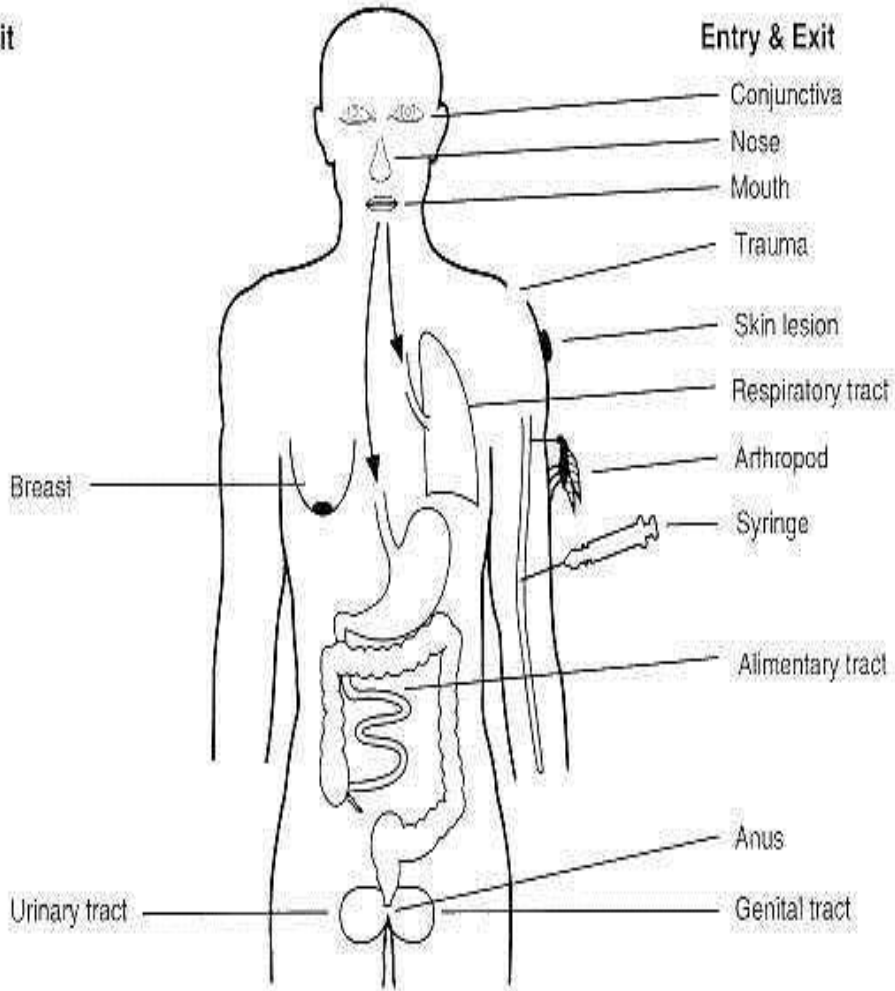


Cont.....Chain of infection

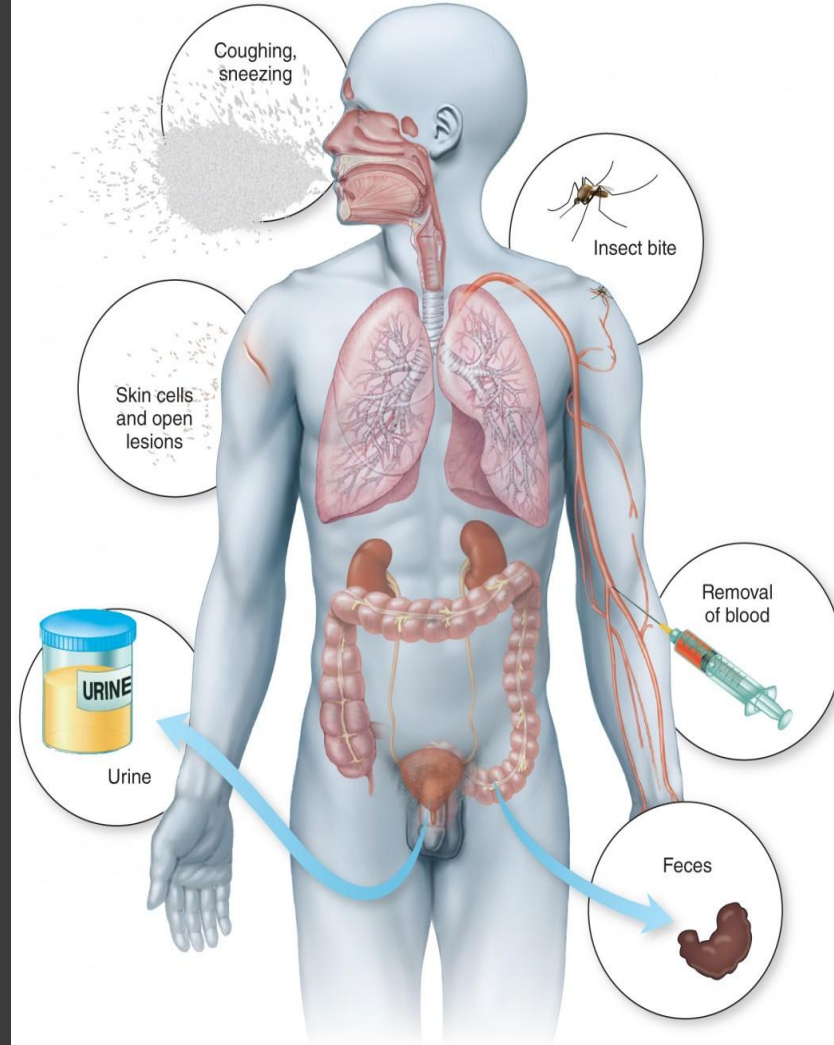
3 - Portal of exit: is a mean (way) for microorganism to leave the source .

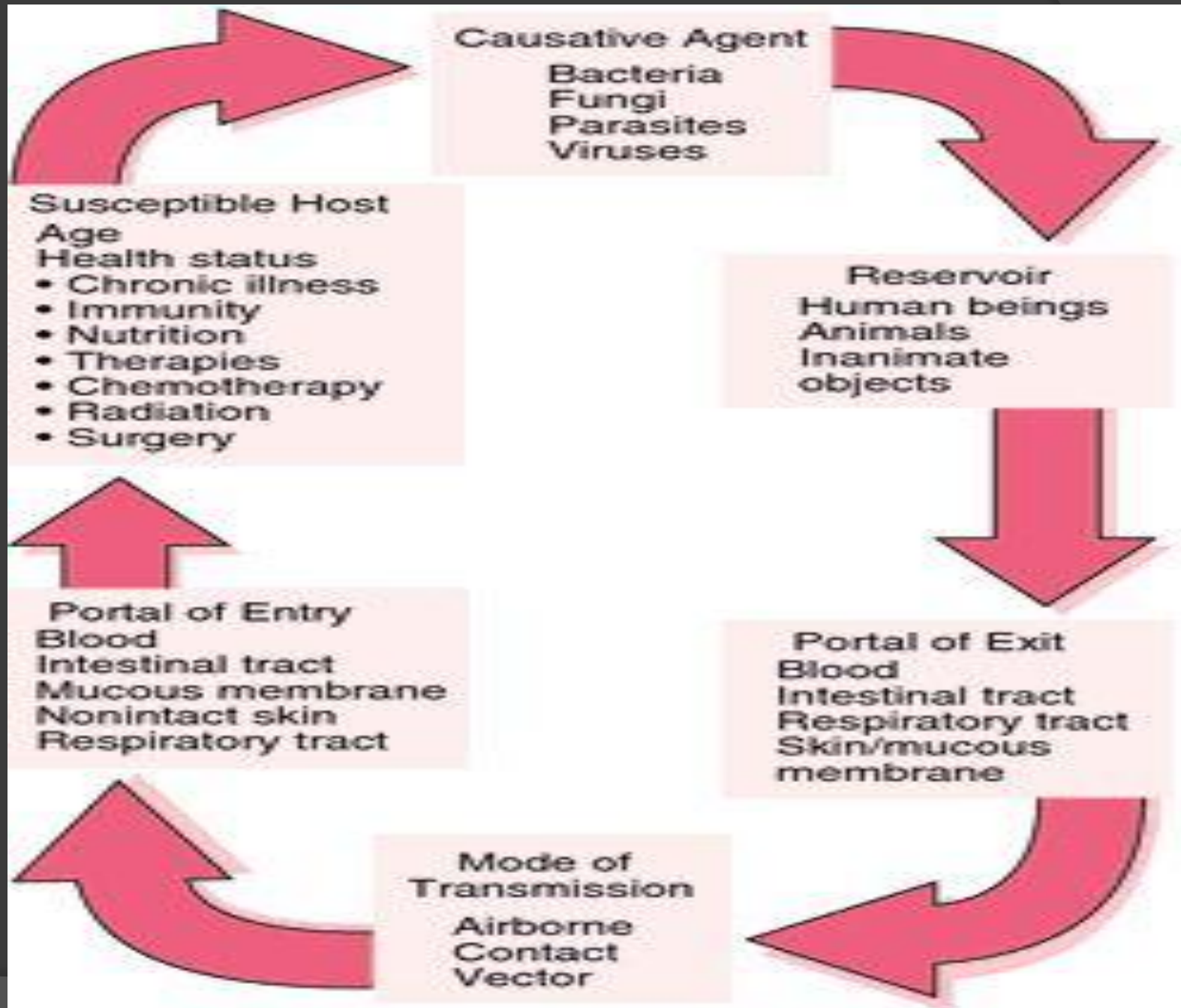
- through Skin (wound drainage) and Mucous Membranes, Respiratory Tract (Sputum), Urinary Tract (urine), Gastrointestinal tract (emesis, stool), Reproductive Tract (secretions from genitals), and Blood; all permit microorganisms to exit the source.

Exit



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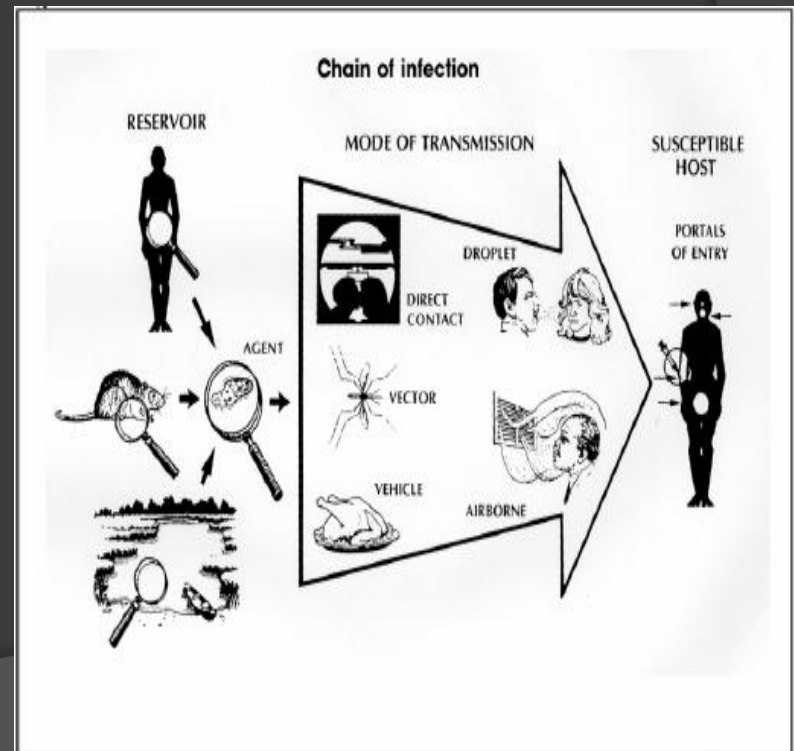


4 Mode of transmission: the way in which the organism moves or is carried from the source's portal of exit to the host.

- are contact, droplet, vehicle, airborne and vector.

Modes of Transmission

Direct transmission	Indirect transmission
Direct contact	Airborne
Droplet spread	Vehicle borne
	Vector borne



(1) Contact transmission: is the most frequent means or route of transmitting infections in health care facilities.

⊙ Contact transmission is by direct or indirect contact.

) **A) Direct contact**

) **B) Indirect contact**

- ◎ **)A) Direct contact:** it is body surfaces to body surfaces contact causing the physical transfer of organism between an infected or colonized person and a susceptible host. Healthcare personnel can transfer organisms to client during care .
- ◎ Direct transfer also may be between two clients, with one acting as a source and the other as the host.

- ◎ **)B) Indirect contact:** Indirect contact occurs when a susceptible host is exposed to a contaminated object such as a dressing, needle or surgical instrument.



2- Droplet transmission: occurs when mucous membrane of the nose, mouth or conjunctiva is exposed to secretions of an infected person who is coughing, sneezing or talking.



DROPLET TRANSMISSION

Droplets should come in contact with mucus membrane directly or indirectly through sneezing, coughing, talking etc. Examples of droplet transmission include influenza, meningitis etc.



Fate of Droplets



Droplets can remain suspended in the air for hours.

Organisms Liberated

Talking	0-200
Coughing	0-3500
Sneezing	4500-1,000,000



3- Vehicle transmission: the transfer of microorganisms by way of vehicles, or contaminated items that transmit pathogens .

◎ **Vehicle:** inanimate object (food, water, etc) that can carry an agent from one person to another

◎ **Food** can carry Salmonella, **water** can carry Legionella, **drugs** can carry bacteria from contaminated infusion supplies, and **blood** can carry hepatitis, and human immunodeficiency virus.



4- Air-born transmission: occurs when fine particles are suspended in the air for a long time or when dust particles contain pathogens and the air currents widely disperse organisms, which can be inhaled by or deposited on the skin of a susceptible host.

AIR BORNE TRANSMISSION

- DROPLET NUCLEI IN THE ATMOSPHERE
- RESPIRATORY SECRETIONS ON SURFACE (FOMITES)



(5) Vector transmission: vectors (living carriers of pathogens are called vectors) can be biological or mechanical.

Definitions

- **Animal Vectors**

- An animal (nonhuman) that can transmit an infectious agent to humans
- **Two types: mechanical and biological**
 - Biological animal vectors: The infectious agent must incubate in the animal host as part of the agent's developmental cycle; eg, the transmission of malaria by infected mosquitoes
 - Mechanical animal vectors: The infectious agent is physically transmitted by the animal vector, but the agent does not incubate or grow in the animal; eg, the transmission of bacteria sticking to the feet of flies



- ⦿ **Biological vectors** are living animals, such as rats or insects that carry pathogens.
- ⦿ **Mechanical vectors** are inanimate objects that are contaminated with infected body fluids such as contaminated needles, and syringe shared by intravenous drug users.

- ⦿ **Vector transmission:** vectors (living carriers of pathogens are called vectors, mosquitoes, flies, fleas, ticks and lice are the most common vectors that transmit diseases to human beings.
- ⦿ **These vectors spread disease** by transferring microorganisms from their feet, wings or bodies to food, which person eat, unaware that the food is contaminated.
- ⦿ **Another method of disease** spread occurs when vectors become infected themselves and bite a victim who then become infected)

Infection Control

Route	Example	Control Measures
Direct contact	Kissing, sexual contact, skin-to-skin contact	Use of barrier (condom, clothing, dressing)
Droplet	Organism on large respiratory droplets that people sneeze, cough, drip, or exhale.	Respiratory etiquette
Indirect contact	Contact with contaminated surfaces, clothing, etc	Hand-hygiene, sanitizing infected surfaces
Vector	Bite from disease-carrying ticks, fleas, mosquitoes	Vector control
Vehicle	Eat/drink contaminated food/drink, transfuse infected blood, fomites (bedding, infected tattoo needle)	Proper hygiene and sanitation, cook food/boil water, etc.
Airborne	Organism on dust particles or small respiratory droplets	Respiratory etiquette, isolation (if necessary)

Mode of Transmission

Route	Example	Disease
Direct contact	Kissing, sexual contact, skin-to-skin contact	STDs, skin infections, scabies
Droplet	Organism on large respiratory droplets that people sneeze, cough, drip, or exhale. Disease spread when people are close to each other (usually <3 feet) and inhale droplet.	Mumps, pertussis (whooping cough), common cold, 'strep throat', meningitis
Indirect contact	Contact with contaminated surfaces, clothing, etc	Skin infections, diarrheal disease
Vector	Bite from disease-carrying ticks, fleas, mosquitoes	Lyme disease, LaCrosse encephalitis
Vehicle	Eat/drink contaminated food/beverage, transfuse infected blood, fomites (bedding, infected tattoo needle)	Some diarrheal disease, hepatitis b/c
Airborne	Organism on dust particles or small respiratory droplets that may become aerosolized when people sneeze, cough, laugh, or exhale	Chickenpox, Tuberculosis, Smallpox, SARS, Anthrax (inhalational)

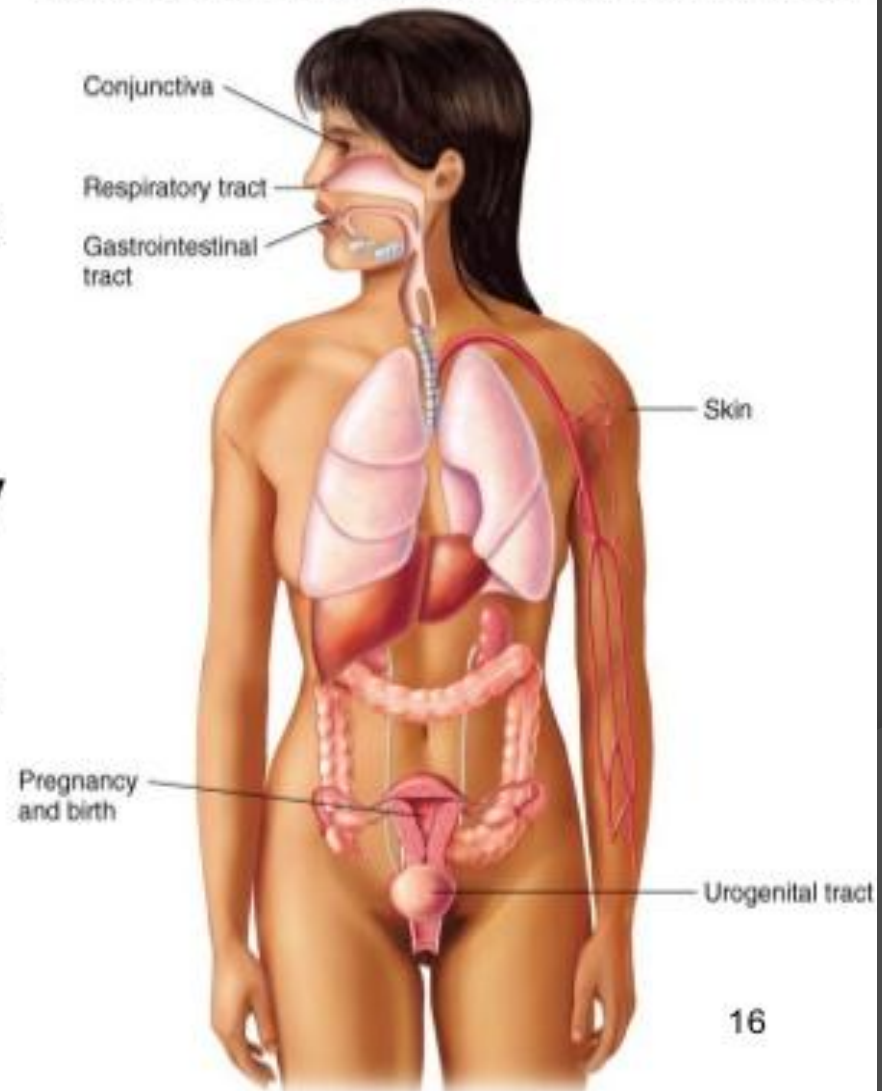
5- Portal of entry: is the pathway by which infectious agents gain access to the person's body. The infectious agent often enters the body by the same way it left the source .

- ⦿ For example, a break in the natural skin barrier allows infections to pass from the skin of the source directly to the skin host .
- ⦿ A cough will allow infectious agent to exit the source via the respiratory tract, and then can enter the host through inhalation.

b) Portals of entry

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- Microbes enter in body by various transmission methods
- Most pathogens have specific portals on entry
 - 1) **Skin**
 - 2) **Gastrointestinal tract**
 - 3) **Respiratory tract**
 - 4) **Urogenital**
 - 5) **Placenta**



Portals of entry

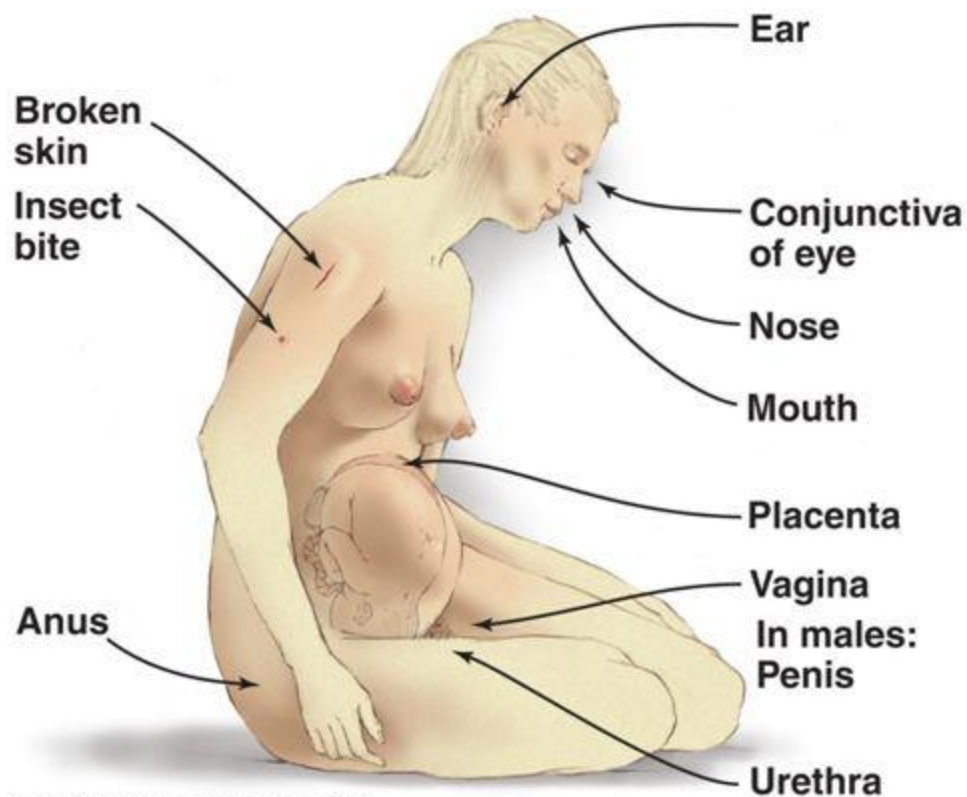
1. Mucus membranes

- Respiratory tract
- Gastrointestinal tract
- Genitourinary tract
- Placenta

2. Skin

3. Parenteral route

- Bite, puncture, injection, wound



5- Portal of entry: pathogens need a portal of entry to gain access to person body. They can enter through:

- ⦿ **respiratory,** gastrointestinal, urinary, reproductive system and through breaks in skin or mucous membranes .
- ⦿ **Open wounds,** incisions puncture sites from injections, or body orifices into which catheters or tubes or similar devices are inserted are common portal of entry(

Cont...chain of infection

6- Susceptible host: is a person whose own body defense mechanism when exposed, are unable to withstand the invasion of pathogens.

Next Sick Person

(Susceptible Host)

- Babies
- Children
- Elderly
- People with a weakened immune system
- Unimmunized people
- Anyone



Germ

(Agent)

- Bacteria
- Viruses
- Parasites



How Germs Get In

(Portal of Entry)

- Mouth
- Cuts in the skin
- Eyes



Chain of Infection

Where Germs Live

(Reservoir)

- People
- Animals/Pets (dogs, cats, reptiles)
- Wild animals
- Food
- Soil
- Water



Germs Get Around

(Mode of Transmission)

- Contact (hands, toys, sand)
- Droplets (when you speak, sneeze or cough)



How Germs Get Out

(Portal of Exit)

- Mouth (vomit, saliva)
- Cuts in the skin (blood)
- During diapering and toileting (stool)





**BREAK
THE
CHAIN**

BREAKING THE CHAIN OF INFECTION



Breaking the chain of infection

- ◎ **Breaking the chain of infection: The nurse may prevent an infection from developing or spreading** by minimizing the numbers and kinds of organisms transmitted to potential infection sites .

1- Eliminating reservoir (source) of infection:

the nurse helps to eliminate areas in which pathogens might grow and multiply

- ⦿ properly disposing of contaminated dressing or body fluids;
- ⦿ dispose of outdated IV solutions and medication; proper cleaning of spills ;
- ⦿ using disposable equipment; discarding any broken sterile packages; not wearing jewelry; colored nail polish or artificial fingernails; proper hand washing.

2- Control of the Portal of exit: (keeping all wound covered; following isolation technique; proper hand washing).

3- Control of the Mode of transmission: (correctly using of masks and gloves; properly disposing of wound drainage; urine, feces, carefully disposing of dressing, diapers or tubing, proper catheterization and injection technique ; correct handling of all body fluids, hand washing).

4- Control of the Portal of entry:

(following prescribed protective isolation protocol; using correct sterile technique for invasive procedures; hand washing.)

5- Susceptible host: (promoting adequate nutrition, hydration, and rest, careful monitoring for skin integrity, administering prescribed medication, careful history taking (past related infection, diabetes))

7- Proper use of sterile supplies, barrier protection, and hand washing to control the spread of microorganisms .

8- A preventive measure is to Strengthen a potential host's defenses against infection by Nutritional support, rest, and maintenance of physiological protective mechanisms protect the patient from invasion by pathogens.

- ◎ The nurse must know the infectious organism and how it is transmitted, the actions needed to protect the client from exposure to the microorganisms .

Nosocomial Infections



Health Care-Associated Infections

- **Introduction:** Just by entering a hospital, patients exchange their secure home environment which may not have the same standard of cleanliness and in which many organisms have developed a resistance to antibiotics .
- Sharing facilities, equipment and staff with other patient further compound this risk.

Definition Health Care-Associated Infections:

- Is infection acquired by an individual in a health care facility such as a hospital and not present or incubating on admission or by health care workers through their work in the hospital.
- Moreover, Health Care-Associated Infections are also known as hospital-acquired infections or, more recently, Nosocomial infection.

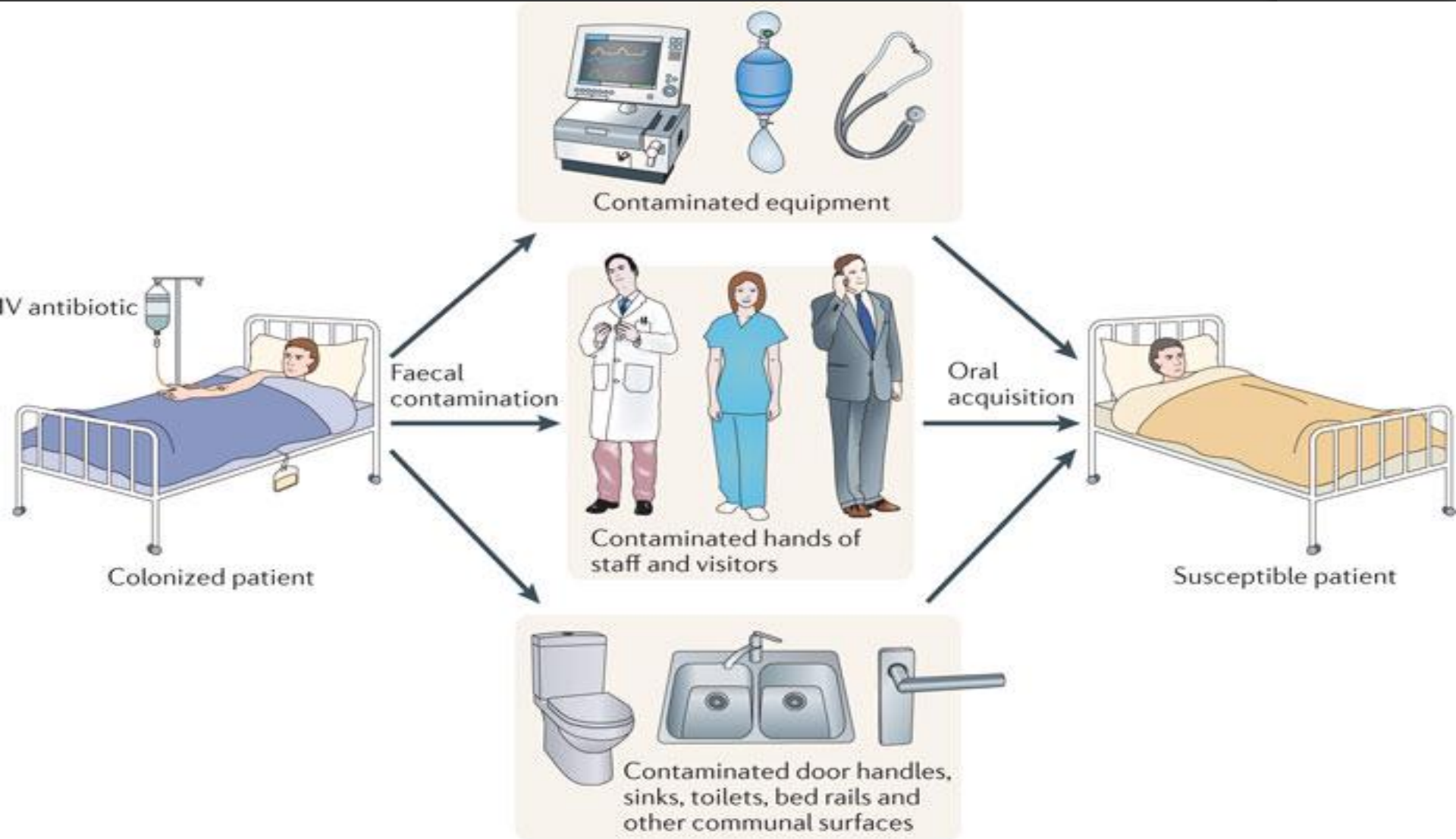
- ◎ **For a HAI, the infection must occur:**
 1. up to 48-72 hours after hospital admission
 2. up to 3-10 days after discharge
 3. up to 30 days after an operation



Causative agents of nosocomial infection:

- ◎ Many different pathogens may cause nosocomial infections such as **Bacteria, fungus, and viruses.**
- ◎ **Bacterial infections** are the most common nosocomial pathogens (Bacteria alone cause about 90 percent of these cases).

Sources of Infection



Root Causes of Nosocomial Infections

- Lack of training in basic Infection Control (IC)
- Lack of an IC infrastructure and poor IC practices (procedures)
- Inadequate facilities and techniques for hand hygiene
- Lack of isolation precautions and procedures

Root Causes of Nosocomial Infections (2)

- Use of advanced and complex treatments without adequate training and supporting infrastructure, including—
 - Invasive devices and procedures
 - Complex surgical procedures
 - Intravenous catheters, fluids, and medications
 - Urinary catheters
 - Mechanical ventilators
- Inadequate sterilization and disinfection practices and inadequate cleaning of hospital

Predisposing factors in NI

(1) Factors related to patient:

- ◎ **Trauma:** can cause breaks in the skin, which leaves the body weakened against fighting infection. E.g. burns, compound fracture, or stab wound.
- ◎ **Pre – existing disease:** generally poor health or frequent illness before entering the hospital, the patient may have an infection or condition that has lowered the body's defense e.g. autoimmune disease, diabetes or diminished lung disease.

- ⦿ **Age:** The very young and very old don't have a defense as do people of other age groups.
- ⦿ **Inactivity:** the person who is ill usually doesn't get much exercise, which leaves the body weakened against fighting infection.
- ⦿ **Poor nutrition or inadequate hydration:** lack of protein hinders the ability of the immune system to make antibodies and repair injured tissues

◎ **Stress or emotional shock:** increased stress increases the body cortisone levels, reducing resistance to disease.

◎ **Fatigue:** The person who is extremely tired can't effectively fight off disease.

- ◎ **Frequent or inappropriate use of broad-spectrum antibiotics:** microorganisms that the person is harboring may develop resistance to antibiotic therapy after repeated exposure to the same antibiotic.
- ◎ The person may stop taking an antibiotic before the full course of therapy is completed or taken when they are not needed.

(2) Factors related to Medical and surgical interventions:

- ◎ Surgical incisions
- ◎ Intravascular devices provide a way of entry for pathogens. Type and number of invasive procedures and length of hospitalization influence the risk of infection e.g. urinary catheterization often causes UTI. Prosthetic joints and heart valves provide a protected niche for bacterial growth.
- ◎ Immunosuppressive therapy allows even low-virulence organisms to assume a dangerously pathogenic role.

- ◎ The **medical therapy** can facilitate infection **include anesthesia and ventilation** (may lead to nosocomial pneumonia).
- ◎ **Inadequately disinfected equipment** e.g. endoscopes can transmit pathogens such as *Mycobacterium tuberculosis*, as well as hepatitis viruses.

(3) Factors related to hospital environment: Patients may become infected with new organisms, usually from other patients, or more rarely from staff or the environment.

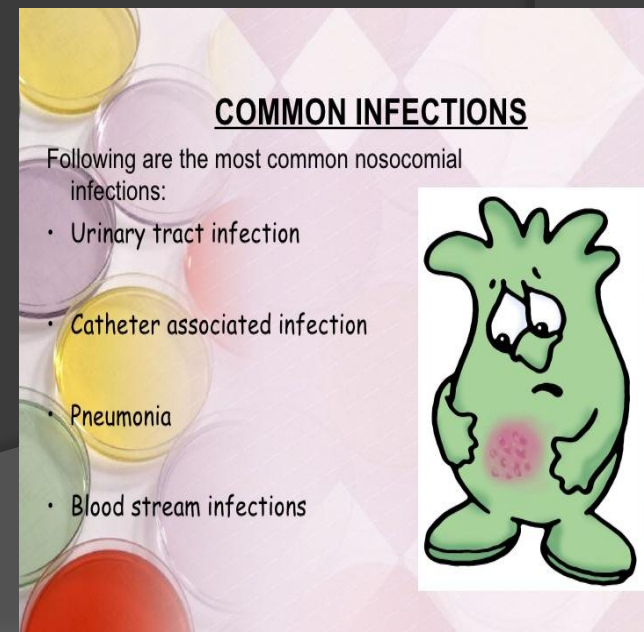
○ **Transient hand carriage** by medical or nursing staff is thought to be the main route of spread.

○ **Overcrowding, understaffing and poor hygiene**, particularly hand washing, increase the risk of cross-infection.



Types of nosocomial infections

- There are various types of nosocomial infections affecting various different sites.
- Urinary tract infections
- Surgical site infections
- Respiratory infections especially nosocomial pneumonia
- Blood infections/ bacteremia
- Skin (especially burns),
- Gastrointestinal tract infections,
- central nervous system infections



Summary

An Ounce of Prevention Keeps the Germs Away

Follow these easy and low-cost steps to stop many infectious diseases.



Clean Your Hands Often

Keeping your hands clean is one of the best ways to keep from getting sick and spreading illnesses.



Routinely Clean and Disinfect Surfaces

Cleaning with soap, water, and scrubbing *removes* dirt and most germs. However, using a disinfectant cleaner *kills* germs, giving even better protection.



Handle and Prepare Food Safely

- Clean hands and surfaces often
- Separate – don't cross-contaminate one food with another
- Cook foods to proper temperatures
- Chill – refrigerate foods promptly



Get Immunized

Getting immunizations is easy, low-cost, and saves lives. Make sure you and your kids get the shots suggested by your doctor.



Use Antibiotics Appropriately

Antibiotics don't work against viruses such as colds and flu. Unnecessary antibiotics can be harmful. Antibiotics should be taken exactly as prescribed by your doctor.



Be Careful with Pets

Pets should be routinely cared for by a vet. Babies and children under age 5 should be watched carefully around pets and animals. Always wash hands after touching animals or animal waste.

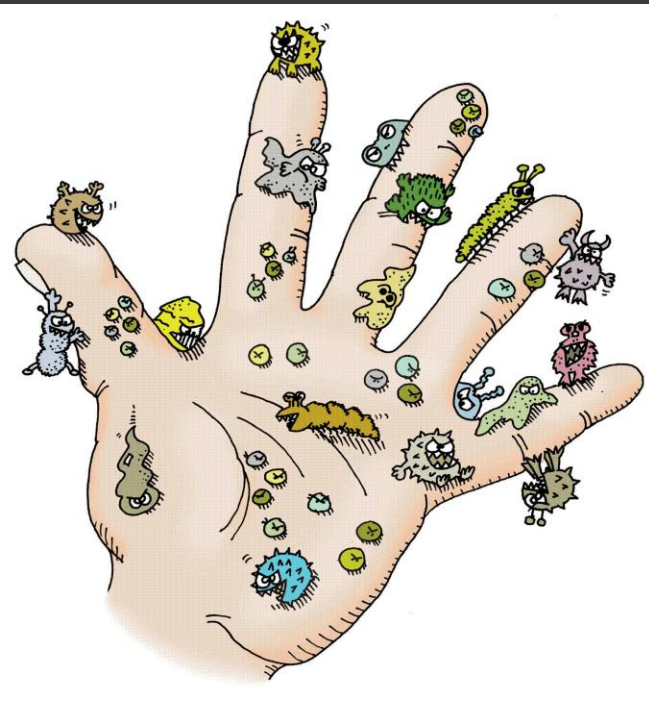


Avoid Contact with Wild Animals

Wild animals can carry deadly diseases and pass them to you and your pets. Keep your house free of wild animals by not leaving any food around. Keep garbage cans sealed.

For information about ordering brochures and posters, please visit www.cdc.gov/ounceofprevention

Infection control



Prevention Health Care- Associated Infections

- ⦿ Although infections in hospitals and in community **are common**, they are **largely preventable**. The prevention and control of infection are moral and legal obligations for all healthcare workers.

Definition of Infection control

- ⦿ the policies and procedures used to minimize the risk of spreading infections, especially in hospitals and human care facilities.

👉 Definition of Infection control:

⦿ is the prevention of the spread of microorganisms from:

- Patient to patient
- Patient to Staff member
- Staff member to patient

Purpose

- ⦿ to reduce the occurrence of infectious diseases.
- ⦿ **Infection control** uses medical and surgical asepsis and standard precautions to prevent or control the spread of microorganisms.

Standard precautions

- ⦿ Have replaced the term **universal precautions** .
- ⦿ Standard precautions are applied to blood, all body fluids, secretions, excretions, contaminated items regardless of whether or not they contain visible blood and non intact skin and mucous membrane.

The elements of standard precautions:

- ⦿ Include hand washing, barrier techniques (include the use of gloves, mask, eye protection, face shield and gown),
- ⦿ occupational health,
- ⦿ handling of linen,
- ⦿ handling of patient care equipment, environmental control, and blood born pathogens and
- ⦿ patient placement.

STANDARD PRECAUTION

- 1. Hand hygiene**
- 2. Use personal protective equipment [PPE]**
- 3. Proper cleaning disinfection and sterilization of patient care equipment.**
- 4. Environmental cleaning and disinfection when necessary.**
- 5. Proper handling of linen.**
- 6. Proper waste disposal.**
- 7. Proper handling and disposal of sharps.**
- 8. Occupational Health**

1- Hand washing

Introduction :

- **Hand washing:** Direct contact between health care staff and patients is generally considered to be primary route by which many exogenously-acquired infections are spread within and between wards.



Definition of hand washing

- is the single most important preventive measure that can be employed in the fight against infection.



7 STEPS TO HANDWASHING



1 Rub palms together



2 Rub the back of both hands



3 Interlace fingers and rub hands together



4 Interlock fingers and rub the back of fingers of both hands



5 Rub thumb in a rotating manner followed by the area between index finger and thumb for both hands

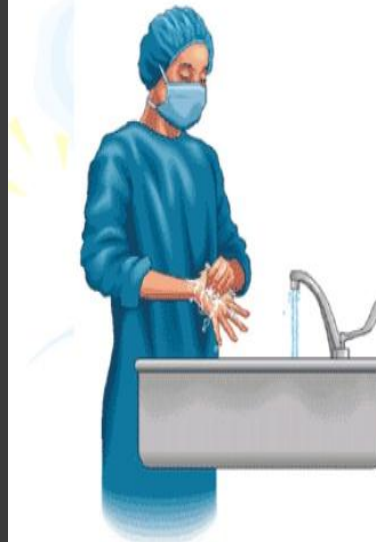


6 Rub fingertips on palm for both hands



7 Rub both wrists in a rotating manner.

Personal Protective Equipment

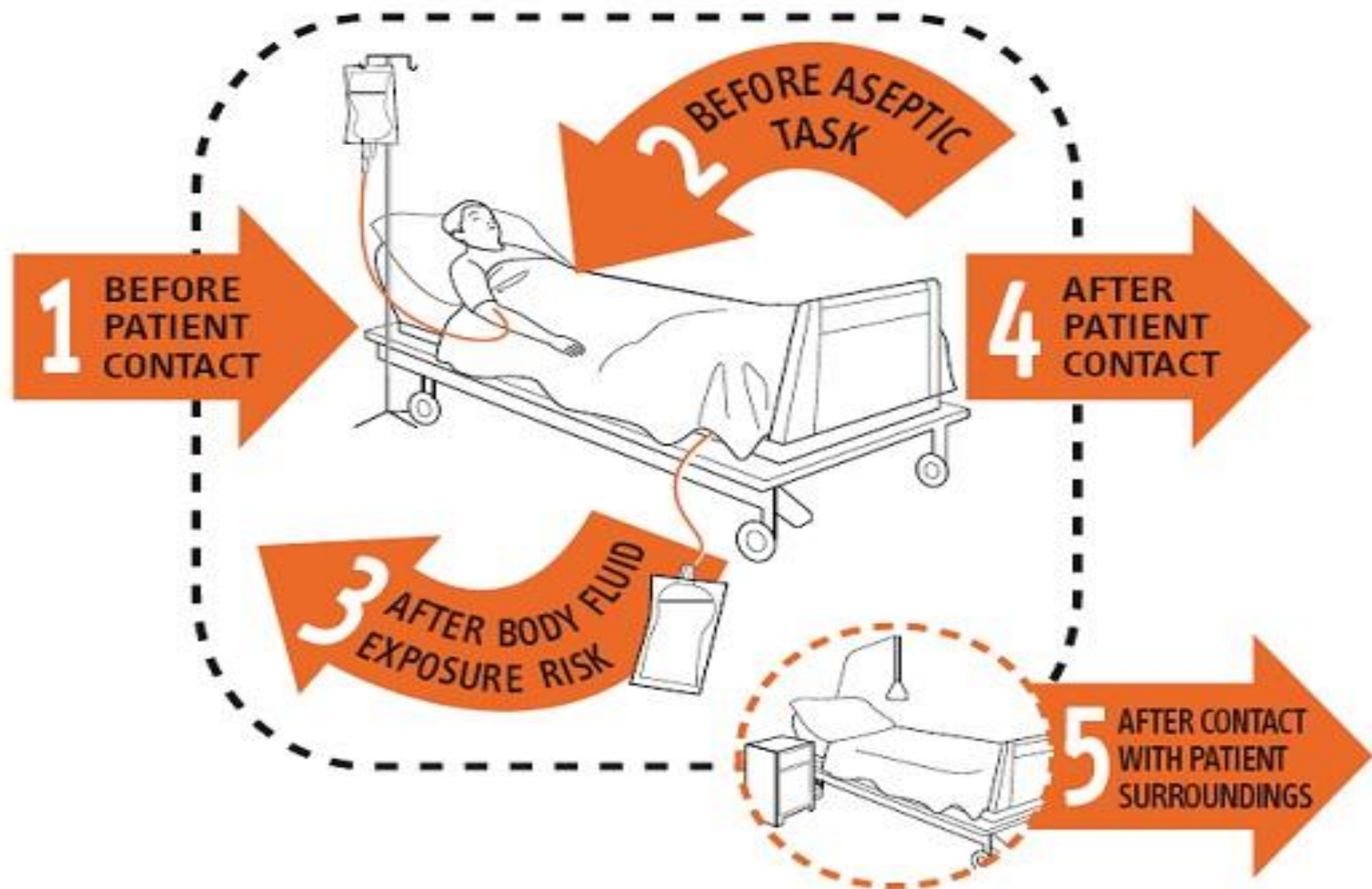


- Gloves
- Aprons
- Gowns
- Protective eyewear
- Face shields
- Masks

Nurses wash hands in the following situations:

- ① When visibly soiled
- ① Before and after client contact
- ① After contact with a source of microorganisms (blood or body fluids, mucous membrane or inanimate objects that might be contaminated).

Your 5 moments for HAND HYGIENE



- ⦿ Before performance of invasive procedures such as placement of intravascular catheters or indwelling catheter .
- ⦿ After removing gloves.

- **Alcohol rubs** can be used as an alternative to routine hand washing with soap and water, but should not be used if hands are visibly soiled.

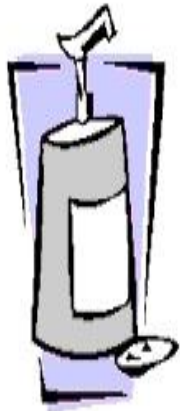
When to Use Hand Sanitizer

- Washing hands with soap and water is the best way to reduce the number of microbes on them in most situations. If soap and water are not available, use an alcohol-based hand sanitizer that contains at least 60% alcohol.



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"How To Use Alcohol Based Hand Rub"



- Apply 2-3 mls of product to the palm of one hand
- Rub hands together, covering all hand surfaces, including fingernails, web spaces, thumbs & palms.
- Ensure hands are dry before performing another task (dries within 15-20 seconds).

NB: Alcohol products are flammable.



There are two types of hand washing to use:

- **Medical Hand washing with soap or detergent:** to remove soil and transient microorganism can be done in routine patient care, before and after patient care, when hands are visibly soiled, after contact with a source of microorganisms and after removing gloves.



- ◎ **Surgical hand washing** to remove transient microorganism and reduce resident flora before and after patient care when performing invasive procedures.



2- Barrier techniques

- ◎ Include the use of personal protective equipment: gloves, eye protection, gowns and mask to keep organisms from entering or leaving the respiratory tracts, eyes or breaks in the skin. They protect the nurse from patient body fluids.



Principles of barrier techniques:

- Put on gloves just before touching mucous membranes and non intact skin .
- Wear gloves, when touching blood, body fluids, secretions, excretions, and contaminated items.

- ⦿ Remove and discard gloves after each individual task before leaving bed.
- ⦿ Change gloves between tasks and procedures on the same patient after contact with material that may contain a high concentration of microorganisms.



⦿ Remove gloves before going to another patient, and wash hands immediately to avoid transfer of microorganisms to other patients or environments.

- Wear a mask and eye protection or a face shield to protect mucous membranes of the eyes, nose, and mouth during procedures and patient-care activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions.



- ① Wear a gown to protect skin and to prevent soiling of clothing during procedures and patient-care activities that are likely to generate splashes or sprays of blood, body fluids, secretions, or excretions.
- ① Select a gown that is appropriate for the activity and amount of fluid likely to be encountered. Remove a soiled gown as promptly as possible.



3-Occupational exposure

- Health care workers are potentially exposed to blood in the course of their work and therefore are at risk of infection with blood borne pathogens, including Human immunodeficiency virus (HIV), hepatitis C and hepatitis B.



- ⦿ Moreover, of all health care workers are at the most risk for needle stick incidents.
- ⦿ Occupational exposures of health care workers occur because of inconsistent compliance with standard precautions.



Exposure to blood can occur through:

- ◎ **Percutaneous injury:** needle stick or other sharp injuries are the main common ways of transmitting large numbers of pathogenic microorganisms in health care institutions.



- ◎ **Mucocutaneous incident:** splash of blood or blood containing fluids into the eyes, nose or mouth.



- ◎ **Cutaneous contact:** occur as a result of breaks in the skin that go unnoticed by the Health Care Workers.

Occupational Exposure

HCW comes in contact with potentially infectious body fluids due to –

- A percutaneous injury (needle stick, cut with sharp object)
- Contact with mucous membrane
- Contact with non intact skin (abraded, chapped, dermatitis)

3- Safe handling of sharps

- Sharps such as needles, razor blades, or any broken glass must be carefully disposed into **sharp container** (puncture-resistant container).
- Used needles and syringes are never placed in any **waste basket**, in nurse' pocket, on patient's tray or on patient's bedside.



- When container is 2/3 full is replaced with new one. Recapping, bending or breaking of contaminated needles is avoided.



Cont.....Safe handling of sharps:

- ◎ **Use one hand technique** or mechanical device only when a sharp disposal box is unavailable or you can't leave the patient's room.
- ◎ **Never recap used needles**, manipulate them using both hands, or use any other technique that involves directing the point of a needle toward any part of the body.



- When recapping needles, both hands should never be used; instead, a one-handed “scoop technique” or another instrument should be used



Wrong method



“scoop technique”

4 - Linen handling

- ⦿ Put on gloves and wear a plastic apron during bed making
- ⦿ Linens are kept away from body to avoid contamination
- ⦿ Placing linens on chair, tables or on the floor are avoided
- ⦿ Soiled linens are kept in leak proof bags
- ⦿ Shake or toss linens are avoided

5- Patient care equipment & Environmental control:

- ⦿ Ensure that **reusable equipment** is not used for the care of another patient until it has been cleaned and reprocessed appropriately.
- ⦿ Ensure that **single-use items** are discarded properly.
- ⦿ Ensure that the hospital has adequate procedures for the routine care, **cleaning, and disinfection of environmental surfaces**, beds, bedrails, bedside equipment, and other frequently touched surfaces, ensures that these procedures are being followed.

- ① Wear gloves, gown and closed shoes (e.g. boots) **when cleaning the environment** and handling infectious waste. Cleaning heavily soiled surfaces (e.g. soiled with vomit or blood) increases the risk of splashes. On these occasions, facial protection should be worn in addition to gloves, gown and closed, resistant shoes.

6- Patient placement

- Side room should be utilized if infected or suspected infected patient requiring **isolation** are admitted or diagnosed within the unit
- If a private room is not available, place the patient in a room with a patient(s) who has active infection with the same microorganism but with no other infection (cohorting)

B-Transmission-based precautions

- include air-borne precautions,
- droplet precautions and
- contact precautions.

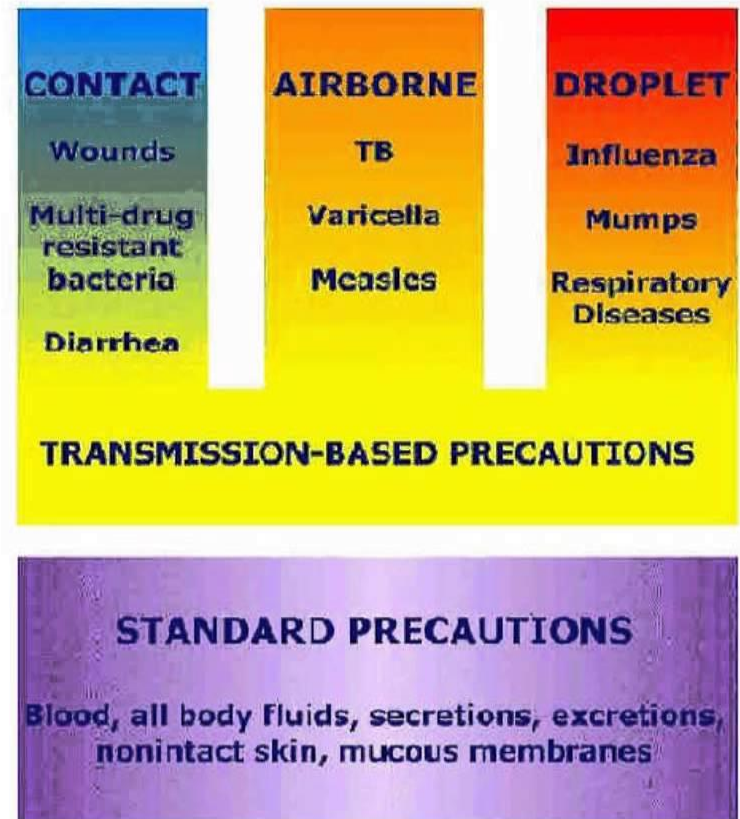
ISOLATION PRECAUTIONS TIER 2

- **Contact** = private room or cohort clients, gloves and gowns
 - MDRO, C-Diff, RSV
- **Droplet** = private room or cohort clients, mask is required
 - Strept, pertussis, mumps, flu
- **Airborne** = private room, negative airflow, hepa filtration; N95 respirator mask required
 - TB, chickenpox, measles

Transmission-based Precautions

- Precautions based on the route of transmission of the microorganism

- Contact Isolation
- Enhanced Contact Isolation
- Droplet Isolation
- Airborne Isolation



- ◎ **(1) Air borne precautions:** are used for diseases transmitted by small droplet nuclei such as measles, pulmonary tuberculosis (TB).
- ◎ **The barrier protection** is private room, negative airflow respirator or mask. Doors are kept closed



(2) Droplet precautions:

- ① are used for diseases transmitted by large droplets such as, pneumonia and meningococcal meningitis.
- ② Droplet transmission occurs when droplets containing microorganisms are propelled through the air from an infected person and deposited in host's eyes, nose or mouth. Transmission can occur through sneezing, coughing, talking or during suction.

(2) Droplet precautions:

The barrier protections:

- ⦿ are private room or cohort client,
- ⦿ The door may remain open,
- ⦿ Mask when closer than 3 feet from patient,
- ⦿ Have the patient wear a mask if you transport him or her to an area outside the room.

DROPLET PRECAUTIONS

(In addition to Standard Precautions)

Visitors — Report to Nurses' Station Before Entering Room

1. PATIENT PLACEMENT

Private Room. When a private room is not available, cohort with patient(s) who has active infection with the same microorganism but with no other infection.

Maintain spatial separation of at least 3 feet from other patients and visitors if cohorting or private room is not available.



2. RESPIRATORY PROTECTION

Mask required when working within 3 feet of patient (or when entering room).
Check your hospital's policy.



3. PATIENT TRANSPORT

Limit the movement/transport of patients from room to essential purposes only.
During transport, **place surgical mask on the patient, if possible.**



(3) Contact precautions: are used for diseases transmitted by direct patient or environmental contact, such as colonization or infection with multi drug resistant organisms, major wound infections, and scabies.

- ⦿ **The barrier protection** includes private room or cohort patient, the door may remain open, gloves and gowns.

CONTACT PRECAUTIONS

(IN ADDITION TO STANDARD PRECAUTIONS)



- **Private Room**

- A private room is indicated, however, patients infected with the same organism may share a room if necessary.

- **Gloves**

- Wear gloves for contact with the patient and/or environment. Change gloves after contact with infective material. Remove gloves before leaving the patient's environment.

- **Gown**

- Wear a gown if you anticipate that your clothes will come into contact with the patient, environmental surfaces, or items in the patient's room. Remove gown before leaving the patient's environment.

- **Wash Hands**

- Wash hands with antiseptic product immediately after glove removal and before leaving the patient's environment.

- **Transport**

- Limit the movement/transport of patients to essential purposes only. During transport, ensure that all precautions are maintained at all times.

- **Equipment**

- Dedicate the use of patient-care equipment to a single patient. If common equipment is used, clean and disinfect between patients.

Decontamination

- Is the process by which microorganisms are removed or destroyed in order to render an object safe. It includes
 - Cleaning,
 - Disinfection, and
 - Sterilization.



The goals of safe reprocessing of medical equipment/devices include:

- a) **Preventing** transmission of microorganisms to personnel and patients

- b) **Minimizing damage to medical equipment/devices** from foreign material (e.g., blood, body fluids, saline and medications) or inappropriate handling.

Definitions

- **Cleaning:** It is the process which physically removes contamination but does not necessarily destroy microorganisms. It is a prerequisite before decontamination by disinfection or sterilization of instruments since organic material prevents contact with microbes, inactivates disinfectants.
- **Disinfection:** It is the process of using an agent that destroys germs or other harmful microbes or inactivates them. **Disinfectant:** It is a chemical substance, which causes disinfection. It is used on non-vital objects to kill surface vegetative pathogenic organisms, but not necessarily spore forms or viruses.

1- Cleaning: is the removal of all foreign material (dirt and organic matter) from the object being reprocessed



2- Disinfection: is a procedure which achieves the removal or destruction of microorganisms to safe or relatively safe levels, but not necessarily the spores.



Disinfection

- ❖ **Is a process used to reduce the number of micro-organisms but not usually bacterial spores.**
- ❖ **The process does not necessarily kill or remove all micro-organisms, but reduces their number to a level which is not harmful to health.**

3. Sterilization:

- ◎ This is a procedure which achieves the Complete killing or removal of all types of microorganisms including the **resistant spores**.
- ◎ Medical equipment/devices that have contact with sterile body tissues or fluids are considered **critical items**.

Cleaning

Disinfection

Sterilization

Manual: Cleaning with
without use of brushes or
specialized tools

Low Level: Kills most vegetative
bacteria, some viruses and
some fungi

High Temperature: Moist or
heat/steam or dry heat

Intermediate Level: Kills
vegetative bacteria, viruses,
fungi, and mycobacterium

Low Temperature: Ozone

Chemical: Liquid sterilants,
Hydrogen Peroxide

Mechanical/Automated:
Ultrasonic or medical washers

High Level: Kills all microbial
organisms – potential to
render device sterile

Gas: Ethylene Oxide

Thermal: Disinfection via
thermal applications
under 100°C

Radiation: Gamma, e-beam

Thank you

