# Cleaning, Disinfection, and Sterilization

## Key Terms:

**Disinfection**

A process that removes or destroys many pathogenic microorganisms on an inanimate object but does not eliminate bacterial spores.

**Sterilization**

A process that can eliminates or destroys all microorganisms in or on an object.

**Asepsis**

Absence of disease-producing microorganisms or pathogens

**Contamination**

Is the presence of microorganisms on inanimate objects (clothing, surgical instruments, environmental surfaces such as floors and tables) or in substances (water, food, milk).

| | |
|---|---|
| **Decontamination** | **Is the removal of disease-producing microorganisms, rendering the object safe for handling.** |
| **Antisepsis** | **Prevent or inhibit the growth of pathogenic organisms** |
| **Cleaning** | **Is the removal of visible foreign material (soil, organic debris) from objects** |
| **Surgical asepsis** | **keeps an object or area free from living organisms** |

# Aseptic Techniques


## Medical Asepsis

- Which applies to patient care procedures outside the operating theatre.
- During medical procedures. Prevent cross-contamination

## Surgical Asepsis

- Surgical asepsis Goal is to keep the surgical environment completely free of all microorganisms
- procedures/processes designed to prevent surgical site infection.

# Principles of Aseptic Technique

- **Only sterile items are used within the sterile field.**
- **Sterile persons are gowned and gloved.**
- **Tables are sterile only at table level.**
- **Sterile persons touch only sterile items or areas, while unsterile persons touch only unsterile items or areas.**
- **Unsterile persons avoid reaching over the sterile field, while sterile persons avoid leaning over an unsterile area.**

# Principles of Aseptic Technique (Continue)

- **The edges of anything that encloses sterile contents are considered unsterile.**
- **The sterile field is created as close as possible to the time of use**
- **Sterile areas are continuously keep in view.**
- **Sterile persons keep well within the sterile area.**
- **Sterile persons keep contact with sterile areas to a minimum.**

# Principles of Aseptic Technique (Continue)

- **Unsterile persons avoid sterile areas.**
- **Destruction of the integrity of microbial barriers results in contamination**
- **Microorganisms must be keep to an irreducible minimum.**

# Exercise

## Apply Your Knowledge

**Describe the difference between medical and surgical asepsis.**

# Answer:

- **Medical asepsis is based on cleanliness and reducing the number of microorganisms as much as possible.**
- **Surgical asepsis is maintaining a sterile environment by eliminating all microorganisms**

# Classification of medical/surgical devices

- critical,
- semi critical
- non-critical

## Critical items

Enter normally sterile tissues, the vascular system, or equipment through which blood flows for example: surgical instruments and vascular catheters. *These items must be properly and safely pre-cleaned and sterilized before use.*

## Semi-critical items

Come into contact with intact mucous membranes or non-intact skin; flexible fibrotic endoscopes, vaginal probes, and respiratory therapy equipment are examples.

*These items require proper precleaning and, at a minimum, high-level disinfection before use.*

## Non-critical items

(such as blood pressure cuffs, stethoscopes) which only contact intact skin have a low risk for spreading infections, except by transferring pathogens to the hands of healthcare personnel.

# Sanitization(cleaning)

- **Scrubbing with a brush and detergent to remove blood, mucus, and other contaminants or media where pathogens can grow**
- **For cleaning items that touch only healthy, intact skin**
- **First step in disinfection and sterilization for other equipment**

# Sanitization (cont.)

- **Collect items for sanitization**
  - Place in water and special detergent solution
  - Use utility gloves
  - Separate sharps from other equipment
- **Scrub items**
  - Follow manufacturers' gui
  - Dry thoroughly
  - Examine carefully

# Sanitization (cont.)

- **Rubber and plastic items**
- **Syringes and needles**
  - **Use disposable whenever possible**
- ***Ultrasonic cleaning***
  - **For delicate instruments and those with moving parts**
  - **Sound waves generated through a cleaning solution to loosen contaminants**

# Exercise

## Apply Your Knowledge

**What is sanitation, and what types of items is it adequate for cleaning?**

# Answer

## What is sanitation, and what types of items is it adequate for cleaning?

- **Sanitation is scrubbing with a brush and detergent to remove blood, mucus, and other contaminants or media where pathogens can grow.**
- **It is adequate for cleaning items that touch only healthy and intact skin. Answer**

# Disinfection

- **Adequate for instruments that do not penetrate skin or mucus membranes and surfaces not considered sterile**
- **‘Disinfection’ means to reduce the number of pathogens on an inanimate surface or object using heat, chemicals, or both.**

# Disinfection (cont.)

- ***Using disinfectants***
  - **Cleaning products applied to inanimate materials to reduce or eliminate infectious organisms**
  - ❖ ***Antiseptics* are anti-infective cleaning agents used on human tissu**
  - **Follow manufacturers' guidelines**

# Chemical disinfection

Common chemical disinfectants include

- alcohols,
- chlorine
- chlorine compounds,
- hydrogen peroxide,
- peracetic acid,
- ammonium compounds .

Such chemicals can be used alone or in combination.

# Disinfection (cont.)

- **Such chemicals can be used alone or in combination.**
- **They must be used in accordance with the manufacturer's instructions and only on surfaces with which they are compatible.**
- **Chemical disinfectants vary widely in the harm they can cause to humans and the en so must be used carefully, and only w suitable alternatives are available.**

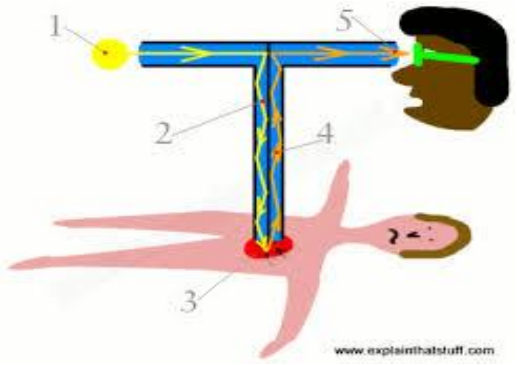
# Disinfection (cont.)

***High-level disinfection*** kills

- bacteria,
- mycobacteria (TB)
- fungi,
- viruses,
- some bacterial spores.

# *High-level disinfection* (Continue)

- **Used for patient-care equipment that touches intact mucous membranes, such as**
  - **vaginal probes**
  - **endoscopes.**
- **HLDs are used to disinfect heat-sensitive and semi-critical devices such as flexible fibrotic endoscopes.**



# *High-level disinfection* (Continue)

**HLDs typically require 10-45 minutes contact time for disinfection, depending on the temperature.**

**After disinfection, items require thorough rinsing with sterile or filtered water to remove any chemical residues; they must then be dried with an alcohol rinse or by blowing clean and filtered air through the device's channels prior to safe storage.**

# 2- Intermediate-level disinfectants

- **Disinfectant kills bacteria, mycobacterium, fungi and most viruses.**
- **They may fail to kill spores, even after prolonged exposure.**
- **Used to clean blood spills and other environmental cleaning.**
- **Not licensed for disinfection of patient ca equipment that touches mucous membra**

# 3- Low-level disinfectants

- ***Low-level disinfection*** **is used for environmental cleaning.**
- **It kills most bacteria, some fungi and some viruses.**
- **It does not kill bacterial spores and is less active against some gram negative rods, such as pseudomonas and mycobacteria.**
- **In many cases, washing with un-medicated soap and water would be sufficient in place of LLD.**

# Exercise

## Apply Your Knowledge

**What is the difference between a disinfectant and an antiseptic?**

# Answer

**Disinfectants are cleaning products applied to inanimate materials to reduce or eliminate infectious organisms.**

**Antiseptics are anti-infective cleaning agents used on human tissue**

# Other Disinfectant Methods

## 1- Fumigation

- **Recently, there has been much interest in using fumigants to deal with healthcare-associated pathogens.**
- **A common process is to vaporize a solution of hydrogen peroxide into a sealed room, such as a patient room, for surface decontamination.**
- **Spore strips are strategically placed throughout the room and retrieved later to monitor the effectiveness of the process.**
- **Disadvantages include incompatibility with cellulosic materials and potential corrosion of electronic devices.**
- **The rooms must not only be sealed but also darkened to prevent daylight accelerating the breakdown of the gas.**
- **However, an ozone-based medical device sterilizer is now available.**

# 2- Ozone

- **is used as a disinfectant for water and food.**
- **It is used in both gas and liquid forms as an antimicrobial agent in the treatment, storage and processing of foods, including meat, poultry and eggs.**
- **Many use ozone technology to purify their water and sewage**
- **Ozone is used to disinfect swimming pools.**

# 3- Filtration

- **A simple means of removing microbes from air or heat-sensitive liquids is by passage through membrane or filters.**
- **This process retains physical microorganisms based on their size, without killing them unless the filter matrix is impregnated with or exposed to a microbicidal agent.**
- **High efficiency particulate air (HEPA) filters are frequently used to remove microbial contamination from air in surgical theatres, microbiology laboratories, and for sterile manufacturing of pharmaceuticals.**
- **Their use in hospital wards and waiting rooms is also increasing to reduce the risk of spread of airborne pathogens.**

# 4- Ultraviolet Radiation

- **Recent advances in ultraviolet (UV) lamp technology make the microbial potential of short-wave UV radiation viable for a variety of uses.**
- **UV lamps are increasing popular for disinfection of water.**
- **UV-based devices are also being marketed for the disinfection of air in hospitals and clinics to reduce the spread of airborne pathogens.**
- **Devices are now being marketed for the disinfection of environmental surfaces in hospitals.**
- **UV radiation does not add any chemicals to the water and air being treated.**
- **Such lamps require regular cleaning and periodic replacement; they can still emit visible light even after the UV radiation has diminished.**

# Sterilization

- **Required for all instruments or supplies that**
  - **Penetrate the skin**
  - **Contact normally sterile areas of the body**
- **Object is either sterile or not sterile**
  - **If unsure of sterility, consider it not sterile**
- **Prior to sterilization**
  - **Sanitize**
  - **Disinfect**

# Steam Sterilization

- **Steam is the most reliable means of sterilization.**
- **It is non-toxic, has broad-spectrum microbicide activity, and good penetrating ability, while being cheap and easy to monitor for efficacy.**
- **Sterilization requires direct contact of an item with steam at a required temperature and pressure for a specified time.**
- **Autoclaves are specially designed chambers in which steam under pressure produces high temperatures. They are based on the same principle as pressure-cookers.**

# Sterilization: *The Autoclave*

- **Primary method of sterilization**
  - **Pressurized steam**
  - **Operates at lower temperatures than dry heat sterilization**
  - **Moisture causes coagulation of proteins in microorganisms at lower temperatures**
  - **Cell walls burst when cell co microorganism**

# Sterilization: *The Autoclave (cont.)*

- Wrap sanitized and disinfected items
  - Special porous fabric, paper, or plastic
  - Items should not touch
  - Label
- Check water level – distilled water only
- Preheat, but do not overheat
- Load, choose correct setting, run cycle
  - Temp = 250° to 270° F
  - Pressure 15 to 30 pounds
- Unload

# Sterilization: *The Autoclave (cont.)*

- **Store items properly**
  - **Clean, dry location**
  - **Shelf life based on packaging, but generally 30 days**
- **Clean autoclave and area**
- **Quality control checks**
  - ***Sterilization indicators* – confirm that items have been exposed to correct volume of steam at the correct temperature for the correct length of time**
  - **Biological indicators contain bacterial spores and confirm that sterilization occurs**

# Sterilization: *The Autoclave (cont.)*

- **Prevent incomplete sterilization**
  - **Correct timing**
  - **Adequate temperature**
  - **Properly wrapped packs**
  - **Adequate steam levels**
- **Timing**
  - **Preset for load types**
  - **Use sterilization indicators**

# Sterilization: *The Autoclave (cont.)*

- **Temperature**
  - **Too high – steam too little moisture**
  - **Too low – steam too much moisture**
- **Do not overcrowd autoclave**
- **Steam level**
  - **If incorrect, items will not be sterile at end of cycle**

# Other Sterilizers

- **The low-temperature steam-formaldehyde (LTSF) process, steam (50-80°C) is used with vaporized formaldehyde to sterilize heat-sensitive medical devices (even those with narrow lumens).**
- **Flash sterilizer.**

**steam is used to process surgical items for use when a critical item has become accidentally contaminated during an operation or when no other means of sterilization are available. It should never be used for implantable items or to compensate for a shortage of essential instruments. Either a gravity-displacement or pre-vacuum autoclave can be used for flash sterilization of porous or non-porous items without wrapping or with a single wrap.**

# Other Sterilizers

- **Microwaves**
- **Exposure of water-containing items to microwaves generates heat due to friction from rapid rotation of water molecules.**
- **Thus far this process has only been used for disinfecting soft contact lenses and urinary catheters for intermittent self-catheterization. However, small volumes of water could possibly be made safe for drinking by microwaving in a glass or plastic container. Similarly, small glass or plastic objects could be immersed in water and 'disinfected' in a microwave oven.**

# Other Sterilizers

- **Dry-heat sterilization**
- **Hot-air ovens are used for dry-heat sterilization.**
- **They can reach high temperatures and should be equipped with a fan for even distribution of heat.**
- **Preheating is essential before starting the sterilization cycle.**
- **Hot air ovens are simpler in design and safer for use than autoclaves and are suitable for sterilization of glassware, metallic items, powders, and anhydrous materials (oil and grease).**
- **Sterilization takes two hours at 160°C, or one hour at 180°C.**
- **Plastics, rubber, paper, and cloth must not be placed in them to avoid the risk of fires.**

# Monitors

- Biological and chemical indicators are available and must be used for routine monitoring of autoclaves.
- **Biological indicators (BI)**
- Contain the spores of the bacterium. Commercially-available spore strips or vials containing the spores are strategically placed in the load to be sterilized.
- After a cycle, the BI are cultured or evaluated for growth and they must all indicate no growth to declare the sterilization process a success.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# Chemical indicators (CI)

- Are used to assess if the required time and temperature were attained during the sterilization process.
- One type of CI is an autoclave tape that can be affixed to the outside of a package; it shows a color change if the package was exposed to heat.


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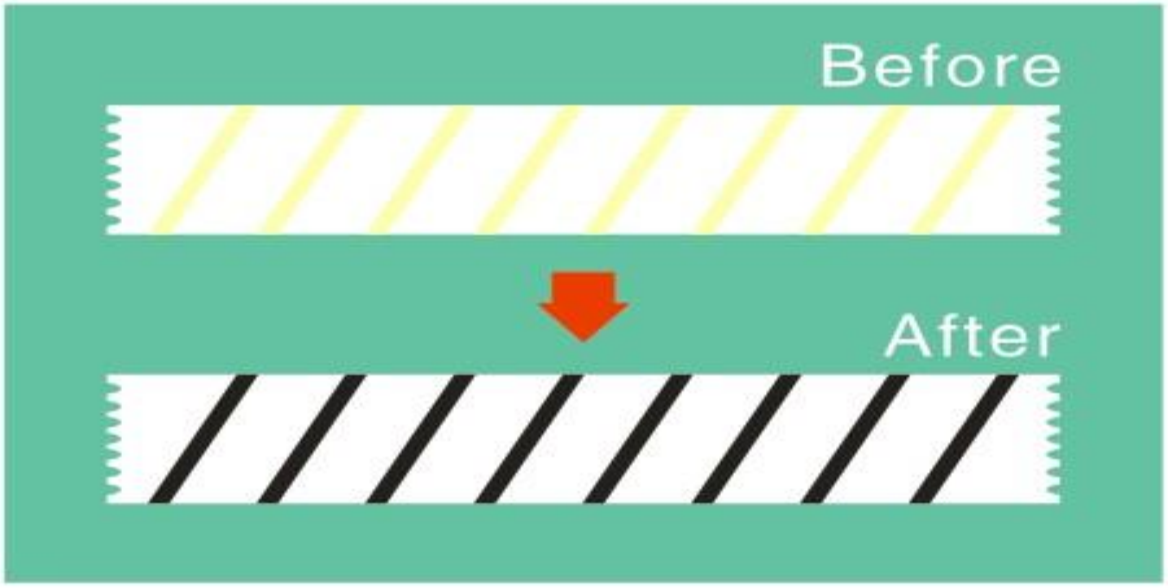

Before
After

# Exercise

## Apply Your Knowledge

**What items need to be sterilized?**

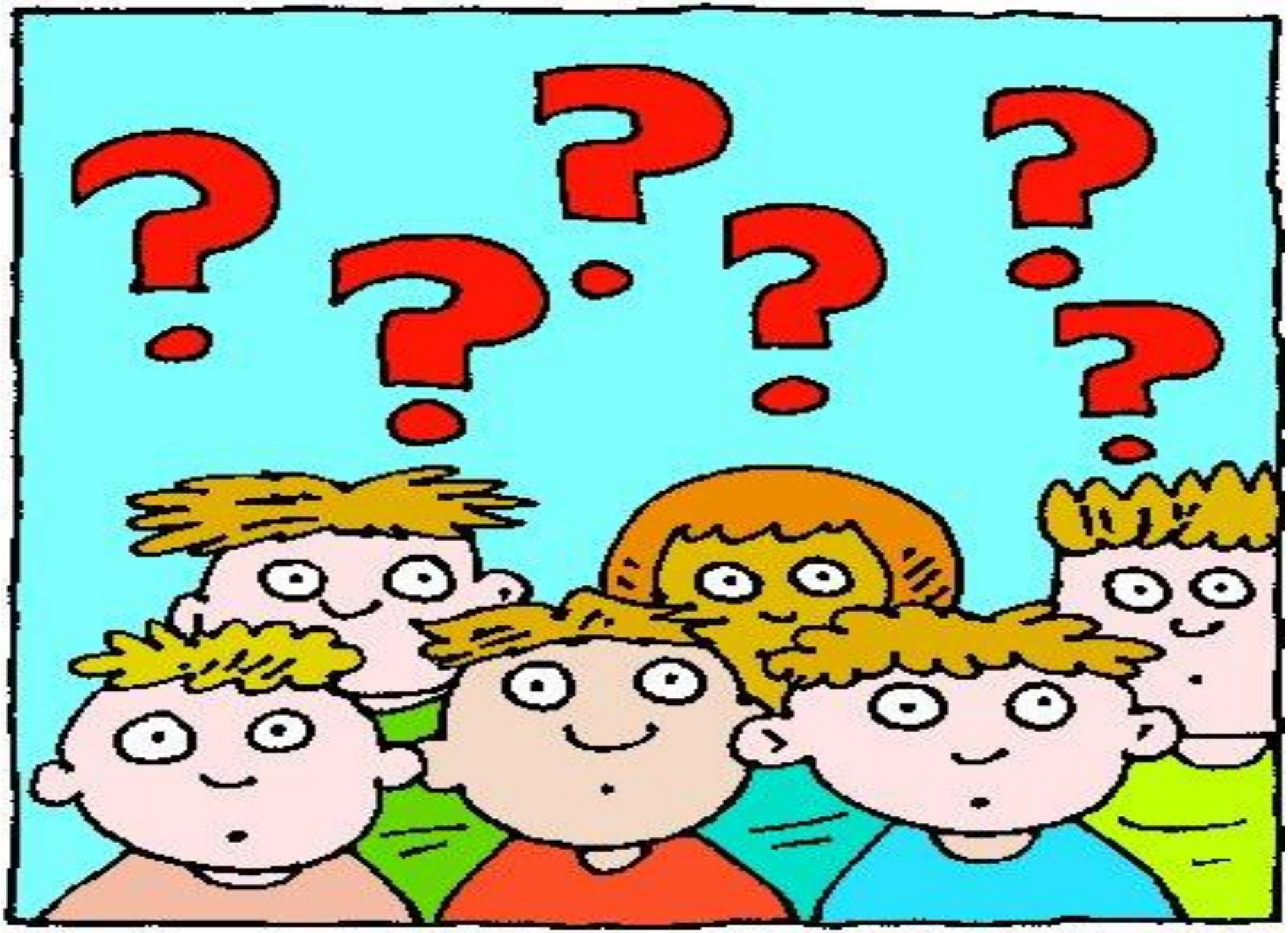
# Answer

## What items need to be sterilized?

- Sterilization is required for all instruments or supplies that penetrate the skin or come in contact with normally sterile areas of the body.

# Reprocessing Steps

- **Pre-cleaning should be done as soon as possible after use, usually at the use location. This removes soil, debris and lubricants from internal and external surfaces.**
- **Cleaning may be manual (scrubbing with brushes) or mechanical, using an automated washer. Cleaning equipment must be used appropriately. For example, do not reuse disposable cleaning equipment. Cleaning solutions must be changed as directed by the manufacturer.**
- **Cleaning is followed by either disinfection or sterilization.**
- **Disinfection requires sufficient contact time of all internal and external surfaces with the solution.**
- **Sterilization requires sufficient exposure time to heat, chemicals or gases**

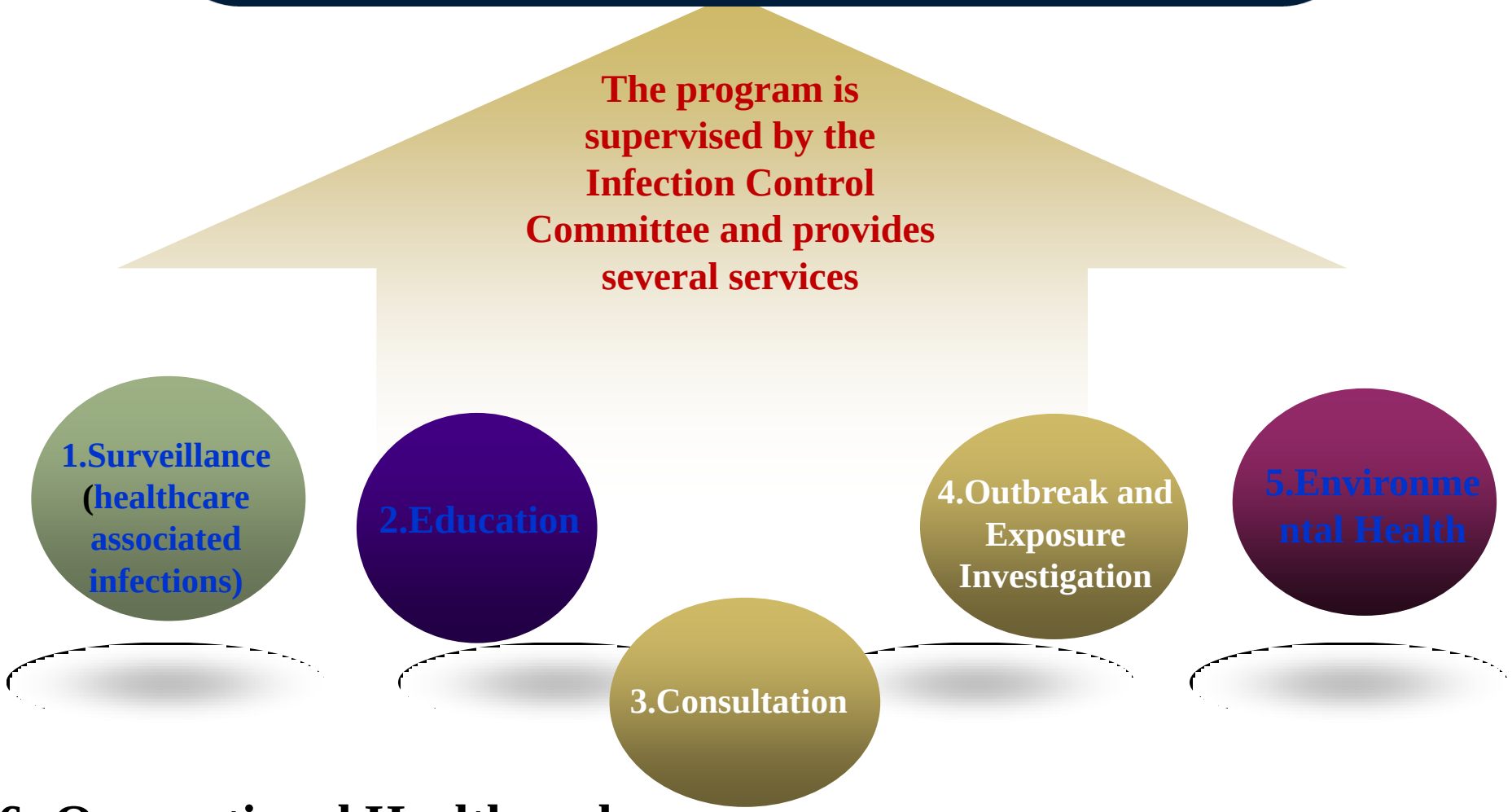


# Infection Control Prevention , Policies, and Procedures

# Infection Prevention And Control Program: ICM

- **The organization establishes and maintains a comprehensive program for infection prevention and control within the standards of the JCI, the recommendations of the Centers for Disease Control and Prevention (CDC) and the guidelines of the respective country's Ministry of Health (MOH).**

# Procedure



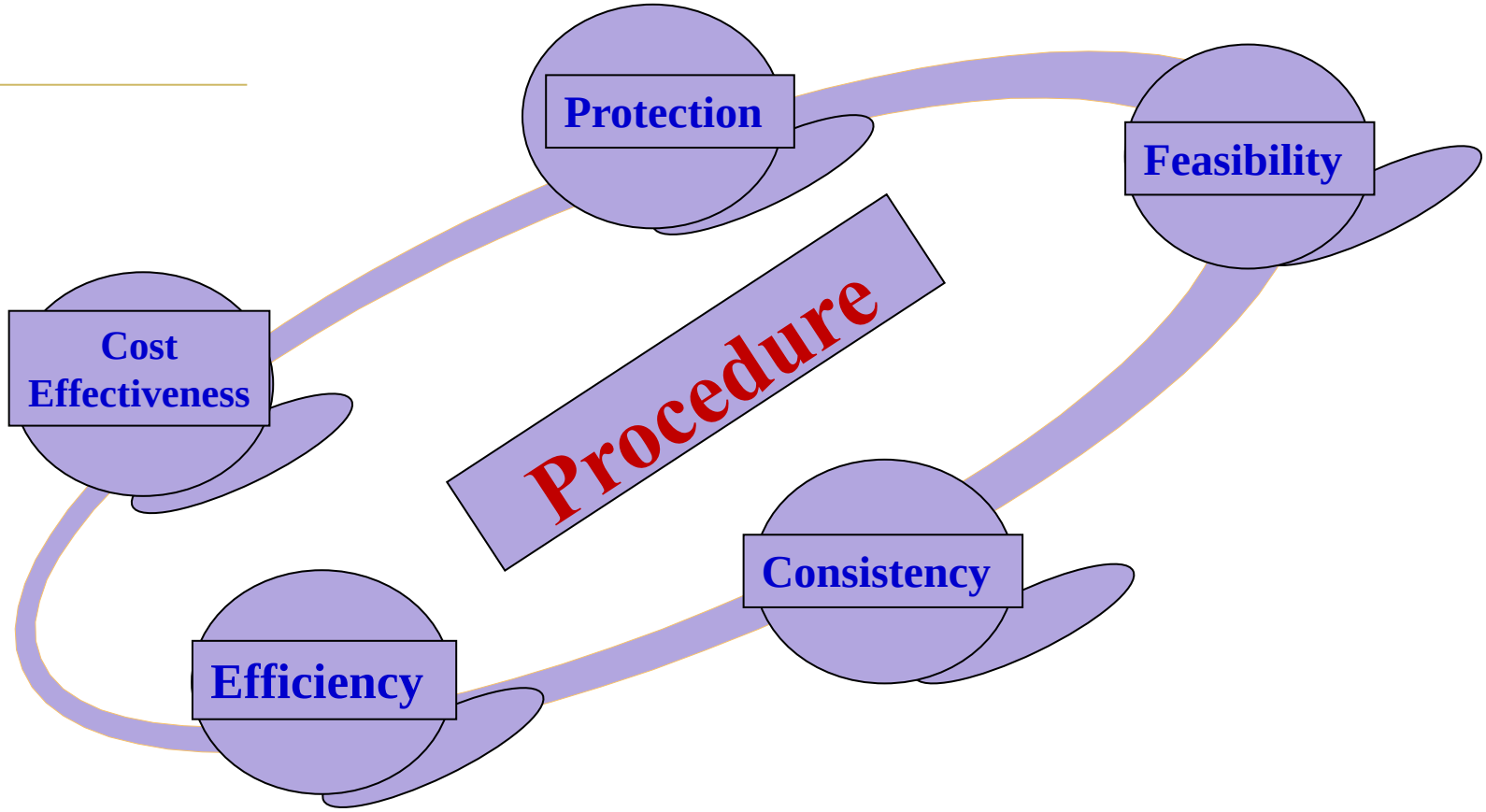

## 6- Occupational Health and Safety (Employee Health)

# Infection Prevention And Control Program: ICM

## Procedure (Continued)

- **The program adapts the system of Standard Precautions, which emphasizes the need to consider all body substances as potentially infectious regardless of the patient's diagnosis.**
- **In adapting this approach to infection prevention and control, the Infection Control Committee has carefully considered each policy and procedure in order to provide the following:**

# Infection Prevention And Control Program: ICM



# Infection Prevention And Control Program: ICM

- **PROCEDURE**

**An ongoing program of theory and practice for continuing education is a major requirement and mandate.**

**Therefore, education, reminders, and instruction on infection prevention and control practices and the principles of Standard Precautions are available for all categories of staff, patients, families and sitters through the Infection Control Department.**

# Standard Infection Control Policies

## Reporting Infections and Infection Concerns

- **All employees must be able to participate in the infection monitoring and reporting process.**
- **All employees having knowledge of an infectious process are required to report that infection to the Infection Control Staff. Any environmental condition(s) that may contribute to an infection must also be reported to the Environmental Health Specialist.**

# Standard Infection Control Policies

## REPORTING INFECTIONS AND INFECTION CONCERNS (Continued)

- **Procedure**
  - **Notify the Infection Control Staff responsible for your area of any patient admitted with an infection or a communicable disease and/or who develops an infection after admission.**
  - **Notify the Infection Control Staff and Environmental Health Specialist of any environmental condition(s) that could contribute to an infection.**

# REPORTING INFECTIONS AND INFECTION CONCERNS (Continued)

- **Procedure**
  - **Call the Infection Prevention and Control Department or page the Infection Control Staff, and include the following information:**
    - **Patient condition(s) Medical record number Patient name Patient location Type of infection concern(s)**
    - **Environmental condition(s) Location Type of Infection Control concern Person(s) at risk**

# Preventing Disease Transmission

- **Patient education**
  - **Health promotion**
  - **Disease prevention**
  - **Disease treatment**
- **Nurse role in patient education**
  - **Share responsibility**
  - **Reinforce and explain instructions**

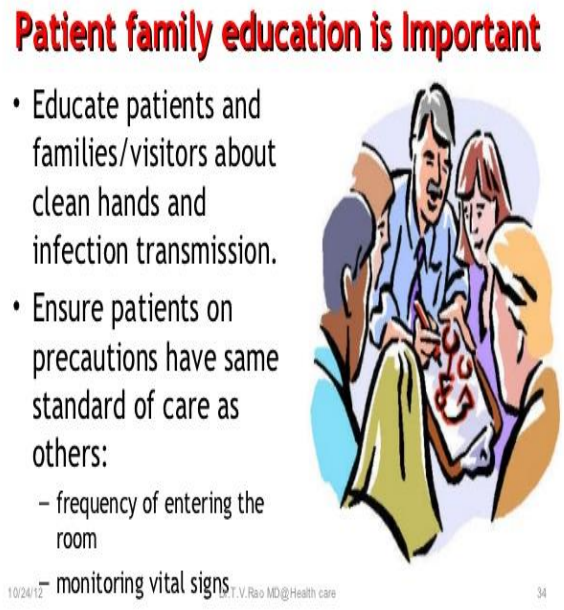
# Preventing Disease Transmission (cont.)

- Nutrition and diet
- Exercise and weight control
- Prevention of STDs
- Smoking cessation
- Alcohol and drug abuse prevention and treatment
- Proper use of medications and prescribed treatments
- Stress-reduction techniques


# Preventing Disease Transmission

## Goal of patient education

- **Help patients take care of themselves**
- **Encourage patients to participate actively in their own health care**




# Exercise

## Apply Your Knowledge

**What three areas should patient education focus on? What is the medical assistant's role in patient education?**

# Answer

## Question

**What three areas should patient education focus on? What is the medical assistant's role in patient education?**

## ANSWER:

- **Patient education should focus on health promotion, disease prevention, and disease treatment.**
- **The nurse shares responsibility with the physician and other staff members and should reinforce and explain instructions given by others.**

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Thank You !