

## Sterilization and operating setup

### Objectives:

- Acquaint with the setup in the operating room.
- Describe the Fundamental principles of aseptic technique in the O.R.
- Demonstrate the correct technique of the surgical scrub, gowning & gloving technique
- Explain the importance of time out process.
- Familiarize the sterilization procedures.

### Resources:

- Davidson's.
- Slides
- Surgical recall.
- 435 Teamwork

[We highly recommend you to watch all the videos of this lecture, they are very helpful.](#)

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COLOR INDEX:

NOTES , IMPORTANT , EXTRA , DAVIDSON'S

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## Important Qs

### 1. The definition of asepsis is:

- A. Soiled or infected with organisms
- B. Capable of producing disease
- C. Absence of microorganisms

### 2. Cross contamination is defined as:

- A. Producing or capable of producing disease
- B. Transmission of microorganisms from patient to patient and from inanimate objects to patients.
- C. Severe toxic state resulting from infection with pyogenic organisms

### 3. Which is the best technique for you to use when rinsing your hands and forearms after a surgical scrub?

- A. Rinsing is not performed after a surgical scrub because it will reduce the antimicrobial activity of the cleansing solution.
- B. Rinsing should start at the elbow with the water running down back down to the hand
- C. Rinsing should start with the hand positioned such that the water runs off the elbow rather than down to the hands

Answers:

1: C 2: B 3: C



- Operating Room Orientation for Medical Students ([Video](#))

## Antiseptic technique

- **Terminology:**

<b>Isolation</b>	Foundation for <b>preventing</b> transmission of infectious agents associated with healthcare delivery. <b>Role:</b> Creates a protective environment that is required to contain transmission of infectious agents
<b>Cross Contamination</b>	Transmission of microorganisms from patient to patient and from inanimate objects to patients. <b>VERY IMPORTANT</b>
<b>Asepsis</b>	- <u>Absence of microorganism</u> that cause disease. <b>VERY IMPORTANT</b> - Freedom from infection.

- **Introduction to Sterile Technique:**

Proper aseptic techniques are one of the most **fundamental** and **essential** principles of infection control in the clinical and surgical setting (prevent surgical site infections). This stepwise process of proper aseptic technique should be performed every single time in the OR.

- **Aseptic Techniques:**

Methods by which contamination with microorganisms is prevented immediately before & during surgical procedures to reduce post-operative infection. These techniques are:-

1. Hand washing.	3. Surgical scrubs.	5. <b>Using surgical barriers (surgical drapes:</b> minimize the passage of microorganisms from non-sterile to sterile areas & PPE which is Personal protective equipment)
2. Surgical attire (e.g. sterile gowning and gloving). (green colored scrubs, only worn in OR) , you should wear a shoe cover and change the scrubs you wear from home.	4. Patient surgical skin prep. E.g. cleaning the abdomen with antiseptic solution (chlorhexidine for example) in laparoscopic surgeries.	6. Using safe operative techniques.



- **Aseptic techniques are those which:**

- Remove, reduce or kill microorganisms from hands & objects.
- Employ sterile instruments.
- Reduce Patient risk of exposure to microorganisms that cannot be removed.

- **Principles of Aseptic Techniques:**

- **Sterile** people touch only **sterile** items or areas.
- **Unsterile** people avoid the **sterile** field.
- **Sterile** field is created as close as possible to the time of use.
- **Sterile** areas are continuously kept in view.
- **Sterile** persons should stay within the sterile area.
- **Destruction of the integrity of the microbial barriers results in contamination.**
- **Only sterile items are used within the sterile field.**
- Sterile persons are gowned & gloved:
  - I. **Gowns** are only sterile from waist to shoulder<sup>1</sup>.
  - II. **Gloved hands must be kept in sight at all times.**
- Only the top of a draped table is considered sterile, while The edges of anything that encloses sterile contents are considered unsterile. (i.e. the table's top surface is sterile, the edges of it is not sterile).

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<sup>1</sup> Armpits are not sterile, so after wearing gloves don't keep your hands under them.



Before proceeding, [here is a great video](#) that explains the scrubbing, drying, gowning and gloving techniques in 7 minutes! :) we highly recommend you to watch it!

- **The Surgical Hand Antisepsis:**

- It is the process of removing as many microorganisms as possible from the hands and arms by mechanical washing and chemical antisepsis before participating in a surgical procedure.

*Despite the mechanical action and the antimicrobial component of the scrub process, **the skin is never sterile.***

## **There are 4 factors affecting the effectiveness of surgical hand antisepsis:**

### **1. The Preparation Before Cleansing:**

- Removal of finger rings, jewelry, nail polish and artificial nails.
  - A. Finger rings & jewelry can harbor microorganisms and dead skin.
  - B. Dark nail polish obscures the subungual space and likelihood of careful cleaning is reduced.

Which means when you have nail polish on, you cannot see your nails, so if you had long nails and nail polish on.. you will not be able to determine if your nails were clean or not.

- C. Artificial nail ↑ the microbial load on hands.
- Perform a preliminary handwashing with antimicrobial soap
- Wash both of your hands and arms, lathering up well, then rinse and dry
- Clean underneath your nail with a nail file

### **2. The Choice of Antiseptic Solution:**

- Antimicrobial **soaps**, aqueous **scrubs** (e.g. biguanides<sup>2</sup>), and alcohol **rubs** are used as antiseptics solutions.
- Alcoholic **chlorhexidine** was found to have greater residual antimicrobial activity.
  - \* Review by *Tanner et al*, reported that **biguanides** (e.g. Chlorhexidine gluconate) are more effective in removing microorganisms on hands than **iodophors** (e.g. Povidone iodine)

### **3. The Cleansing Method:**

- All are performed using a surgical scrub brush and an antimicrobial soap solution. (See *Surgical Scrub Procedure Below*)

### **4. The Duration for Hand Cleansing:**

- All surgical scrubs are **3-5 minutes** in length.
- **5 minutes** is the most important, **2.5 minutes** for each hand.
- Hand washing: 40-60 seconds
- Hand rub: 20-30 seconds

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<sup>2</sup> In case you recall metformin (antihyperglycemic), it's another derivative of biguanides, along with Chlorhexidine (disinfectant).



## Surgical Scrub Procedure ([video](#))

1. Remove sterile disposable brush-sponge from its wrapper and moisten the sponge.
2. Lather fingertips with sponge side of brush, then -using brush side of the brush- scrub the spaces under the fingernails of the right or left hand with 30 circular strokes.
3. Lather digits; scrub 20 circular strokes on all four sides of each finger.
4. Lather palm, back of hand, heel of the hand and space between thumb & index finger (*scrub 20 circular strokes on each surface*)
5. Forearm scrub; divide the forearm into 3 inch increments (*the brush is 3 inches lengthwise*)
  - Use the sponge side of the brush lengthwise to apply soap around the wrist.
  - Scrub 20 circular strokes on all four sides of the wrist, then move up the forearm.
  - Lather, then scrub ending 2 inches above the elbow.
6. Repeat the previous steps for the other arm.
7. Discard the brush.
8. Rinse hands and arms without retracing or contaminating; allow the water to drip from the elbows. After final rinse, turn water off and keep scrubbed hands and arms in view *to avoid* contamination and back into operating room.
 

**Q: What is the best technique for you to use when rinsing your hands and forearms after a surgical scrub? **VERY IMPORTANT****

**A: Rinsing should start with the hand positioned such that the water runs off the elbow rather than down to the hands.**
9. In the operating room, dry hands and arms with a sterile towel before donning (wearing) a sterile surgical gown & glove (*steps below*)

## Drying the Hands ([video](#))

**Step 1:** Reach down to the opened sterile package containing the gown, and pick up the towel.

- *Be careful not to drip water onto the pack.*

**Step 3:** Dry both hands thoroughly *but* independently.

- *To dry one arm, hold the towel in the opposite hand and using the oscillating (circular) motion<sup>3</sup> of the arm, draw the towel up to the elbow.*

**Step 2:** .Open the towel full-length, holding one end away from the non-sterile scrub attire.

- *Bend slightly forward.*

**Step 4:** Carefully reverse the towel, still holding it away from the body.

- *Dry the opposite arm on the unused end of the towel.*

## Gowning Technique ([video](#))

**Step 1:** Reach down to the sterile package and lift the folded gown directly upward.

**Step 3:** Holding the folded gown, carefully locate the neckline.

**Step 2:** Step back away from the table into an unobstructed area to provide a wide margin of safety while gowning.

**Step 4:** Holding the **inside** front of the gown just below the neckline with both hands, let the gown unfold, keeping the inside of the gown towards the body.

- ***Don't touch the outside of the gown with bare hands→ gown is considered contaminated.***

**Step 5:** Holding the hands at shoulder level, slip both arms into the armholes simultaneously.

The circulator (**OR nurse**) brings the gown over the shoulders by reaching inside to the shoulders and arm seams,

- The gown is pulled on, **leaving the cuffs of the sleeves extended over the hands.**
- The back of the gown is securely tied or fastened at the neck and waist, touch the outside of the gown at the line of ties or fasteners in the back only.

<sup>3</sup> Similarly to watch indicator motion.



**Recall :**

**How do I stand if I am waiting for a case to start?**

Hands together in front, above your waist.

● **Summary of gowning principles:**

- Touch only the inside of the gown while donning it.
- If outside is touched, gown is considered contaminated.
- Scrubbed hands and arms are considered contaminated if they fall below the waist level or touch the body
- After donning the gown, the only parts of the gown that are considered sterile are the sleeves and front from the waist level to a few inches below the neck opening.

**Gloving by the Closed Technique (video)**

- Preferred method over open-gloving technique
- Provides a bacterial barrier between patient and surgeon

**Step 1:** Using the right hand (in gloving start with dominant hand) and keeping it within the cuff of the sleeve, pick up the left glove from the inner wrap of the glove package by grasping the folded cuff.

**Step 3:** Grasp the back of the cuff in the left hand and turn it over the end of the left sleeve & hand.  
- The cuff of the glove is now over the stockinette cuff of the gown, with the hand still inside the sleeve

**Step 2:** Extend the left forearm with the palm upward.  
- Place the palm of the glove against the palm of the left hand, grasping in the left hand the top edge of the cuff, above the palm.  
- In correct position, glove fingers are pointing toward you & the thumb of the glove is down.

**Step 4:** Grasp the top of the left glove and underlying gown sleeve with the covered right hand.  
- Pull the glove on over the extended right fingers until it completely covers the stockinette cuff.


**Step 5:** Glove the right hand in the same manner. Use the gloved left hand to pull on the right glove.

**Final Tie of the Gown (video)**



## ● **Surgical safety checklist:**

- It is a method used to prevent doing the wrong surgery to the wrong patient and the wrong site. This includes several things like: Is the patient going to have general or local anesthesia? Does the patient have any allergies? Etc...
- Performed before skin incision.
- It is important to do **THREE surgical countings**: one before the procedure, one in the middle of it and one after the procedure.
- Antibiotic prophylaxis can be given if the patient has risk factors, And if it is indicated it should be given **30-60 minutes** before the procedure.
- Most importantly, check the **time out process** as it is within the objectives.

 <b>SURGICAL SAFETY CHECKLIST (FIRST EDITION)</b>		
Before induction of anaesthesia	Before skin incision	Before patient leaves operating room
<p><b>SIGN IN</b></p> <p><input type="checkbox"/> PATIENT HAS CONFIRMED</p> <ul style="list-style-type: none"> <li>• IDENTITY</li> <li>• SITE</li> <li>• PROCEDURE</li> <li>• CONSENT</li> </ul> <hr/> <p><input type="checkbox"/> SITE MARKED/NOT APPLICABLE</p> <hr/> <p><input type="checkbox"/> ANAESTHESIA SAFETY CHECK COMPLETED</p> <hr/> <p><input type="checkbox"/> PULSE OXIMETER ON PATIENT AND FUNCTIONING</p> <hr/> <p>DOES PATIENT HAVE A:</p> <p>KNOWN ALLERGY?</p> <p><input type="checkbox"/> NO</p> <p><input type="checkbox"/> YES</p> <p>DIFFICULT AIRWAY/ASPIRATION RISK?</p> <p><input type="checkbox"/> NO</p> <p><input type="checkbox"/> YES, AND EQUIPMENT/ASSISTANCE AVAILABLE</p> <p>RISK OF &gt;500ML BLOOD LOSS (7ML/KG IN CHILDREN)?</p> <p><input type="checkbox"/> NO</p> <p><input type="checkbox"/> YES, AND ADEQUATE INTRAVENOUS ACCESS AND FLUIDS PLANNED</p>	<p><b>TIME OUT</b></p> <p><input type="checkbox"/> CONFIRM ALL TEAM MEMBERS HAVE INTRODUCED THEMSELVES BY NAME AND ROLE</p> <hr/> <p><input type="checkbox"/> SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE VERBALLY CONFIRM</p> <ul style="list-style-type: none"> <li>• PATIENT</li> <li>• SITE</li> <li>• PROCEDURE</li> </ul> <hr/> <p>ANTICIPATED CRITICAL EVENTS</p> <p><input type="checkbox"/> SURGEON REVIEWS: WHAT ARE THE CRITICAL OR UNEXPECTED STEPS, OPERATIVE DURATION, ANTICIPATED BLOOD LOSS?</p> <p><input type="checkbox"/> ANAESTHESIA TEAM REVIEWS: ARE THERE ANY PATIENT-SPECIFIC CONCERNS?</p> <p><input type="checkbox"/> NURSING TEAM REVIEWS: HAS STERILITY (INCLUDING INDICATOR RESULTS) BEEN CONFIRMED? ARE THERE EQUIPMENT ISSUES OR ANY CONCERNS?</p> <hr/> <p>HAS ANTIBIOTIC PROPHYLAXIS BEEN GIVEN WITHIN THE LAST 60 MINUTES?</p> <p><input type="checkbox"/> YES</p> <p><input type="checkbox"/> NOT APPLICABLE</p> <hr/> <p>IS ESSENTIAL IMAGING DISPLAYED?</p> <p><input type="checkbox"/> YES</p> <p><input type="checkbox"/> NOT APPLICABLE</p>	<p><b>SIGN OUT</b></p> <p>NURSE VERBALLY CONFIRMS WITH THE TEAM:</p> <p><input type="checkbox"/> THE NAME OF THE PROCEDURE RECORDED</p> <p><input type="checkbox"/> THAT INSTRUMENT, SPONGE AND NEEDLE COUNTS ARE CORRECT (OR NOT APPLICABLE)</p> <p><input type="checkbox"/> HOW THE SPECIMEN IS LABELLED (INCLUDING PATIENT NAME)</p> <p><input type="checkbox"/> WHETHER THERE ARE ANY EQUIPMENT PROBLEMS TO BE ADDRESSED</p> <hr/> <p><input type="checkbox"/> SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE REVIEW THE KEY CONCERNS FOR RECOVERY AND MANAGEMENT OF THIS PATIENT</p>





# Cleaning, Disinfection and Sterilization

- **Terminology:**

1. **Cleaning** is the physical removal of organic material (blood and proteins) or soil from objects, is usually done using water with or without detergents.
2. **Disinfection** is defined as the intermediate measures between physical cleaning and sterilization. In disinfection, we try to reduce the amount of microbes to a minimum level.
3. **Sterilization** is the destruction of all forms of microbial life; it is carried out in the hospital with steam under pressure (autoclave), liquid or gaseous chemicals, or dry heat.

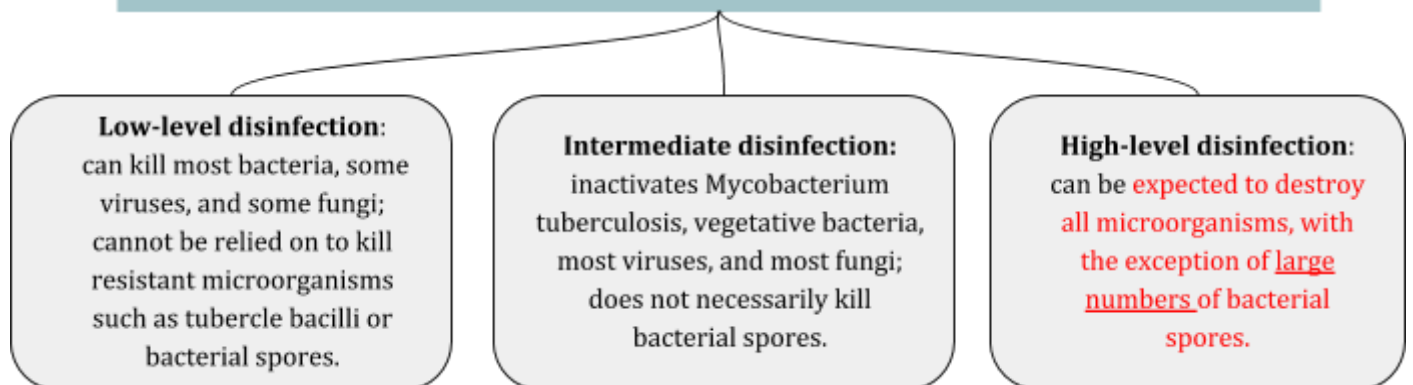
- **Cleaning:**

Items must be thoroughly cleaned before processing, because:

1. Organic material (e.g., blood and proteins) may contain high concentrations of microorganisms.
2. Such organic material may inactivate chemical germicides and protect microorganisms from the disinfection or sterilization process.

- **Disinfection:**

## Types of disinfection

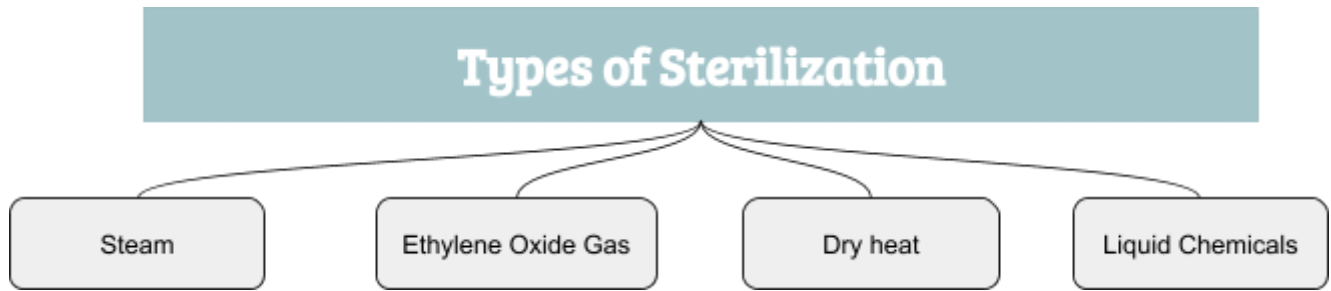


- **The level of disinfection achieved depends on several factors:**

1. **Contact time.**
2. **Temperature.**
3. Type and concentration of the active ingredients of the **chemical germicide.**
4. the **nature of the microbial contamination.**



- **Sterilization:**



### 1. Steam sterilization:

- **Steam sterilization is the most inexpensive and effective method for sterilization.**
- Steam sterilization is unsuitable for processing plastics with low melting points, powders, or anhydrous oils

### 2. Ethylene oxide gas sterilization.

- It is a more complex & expensive process than steam sterilization.
- It is usually restricted to objects that might be damaged by heat or excessive moisture.
- Before sterilization, objects also need to be cleaned thoroughly and wrapped in a material that allows the gas to penetrate.

### 3. Dry heat

- Powders and anhydrous oils can be sterilized by dry heat .
- Microbiological monitoring of dry heat sterilizers usually provides a wide margin of safety.

### 4. Liquid chemicals

- Liquid chemicals can be used for sterilization and disinfection when steam, gas, or dry heat sterilization is not indicated or available



## Sterilization of implantable items:

- Implantable items , such as orthopedic devices, require special handling before and during sterilization; thus, packs containing implantable objects need to be clearly labeled so they will be appropriately processed.
- To guarantee a wide margin of safety, it is recommended that each load of such items be tested with a spore test and that the sterilized item not be released for use until the spore test is negative at 48 hours.

If it is not possible to process an implantable object with a confirmed 48-hour spore test before use, it is recommended that the unwrapped object receive the equivalent of full-cycle steam sterilization and **not flash sterilization** (involving rapid penetration of steam).

**Medical devices, equipment, and surgical materials are divided into three general categories based on the potential risk of infection involved in their use:**

<b>1. Critical items</b>	<ul style="list-style-type: none"><li>• Critical items are instruments or objects that are introduced <b>directly into the bloodstream or into other normally sterile areas of the body</b>.</li><li>• <b>Examples are surgical instruments, cardiac catheters, implants, pertinent components of the heart-lung oxygenator, and the blood compartment of a hemodialyzer.</b></li><li>• Sterility at the time of use is required for these items; consequently, one of several accepted <b>sterilization</b> procedures is generally recommended.</li></ul>
<b>2. Semicritical items</b>	<ul style="list-style-type: none"><li>• These items come in contact with <b>intact mucous membranes</b>, but they do not ordinarily penetrate body surfaces.</li><li>• <b>Examples are noninvasive flexible and rigid fiberoptic endoscopes, endotracheal tubes, anesthesia breathing circuits, and cystoscopes.</b></li><li>• <b>Sterilization is not absolutely essential; at a minimum, a high-level disinfection</b> procedure. In most cases, meticulous physical cleaning followed by an appropriate high-level disinfection treatment gives the user a reasonable degree of assurance that the items are free of pathogens.</li></ul>
<b>3. Noncritical items</b>	<ul style="list-style-type: none"><li>• Noncritical items are those that either <b>do not ordinarily touch the patient or touch only intact skin</b>.</li><li>• <b>Such items include stethoscopes, crutches, bedboards, blood pressure cuffs, and a variety of other medical accessories.</b></li><li>• These items rarely, if ever, transmit disease. Consequently, <b>washing with a detergent</b> may be sufficient</li></ul> <p><b>For noncritical items, cleaning can consist only of:</b></p> <ol style="list-style-type: none"><li>1) washing with a detergent or a disinfectant-detergent</li><li>2) rinsing</li><li>3) thorough drying</li></ol>



## Summary (from the Slides)

To wrap up, general recommendations when it comes to cleaning, disinfection, and sterilization:

<b>Cleaning</b>	All objects to be disinfected or sterilized should first be thoroughly cleaned to remove all organic matter (blood and tissue) and other residue.
<b>Indications for Sterilization and High-Level Disinfection</b>	<ol style="list-style-type: none"> <li>1. Critical medical devices or patient-care equipment that enter normally sterile tissue or the vascular system or through which blood flows should be subjected to a <b>sterilization</b> procedure before each use.</li> <li>2. Laparoscopes, arthroscopes, and other scopes that enter normally sterile tissue should be subjected to a <b>sterilization</b> procedure before each use; if this is not feasible, they should receive at least <b>high-level disinfection</b>.</li> <li>3. Equipment that touches mucous membranes, e.g., endoscopes, endotracheal tubes, anesthesia breathing circuits, and respiratory therapy equipment, should receive <b>high-level disinfection</b>.</li> </ol>
<b>Methods of Sterilization</b>	<ul style="list-style-type: none"> <li>• Whenever sterilization is indicated, a <b>steam sterilizer</b> should be used unless the object to be sterilized will be damaged by <u>heat, pressure, or moisture</u> or is otherwise inappropriate for steam sterilization. In this case, another acceptable method of sterilization should be used.</li> <li>• Flash sterilization [270°F (132°C) for 3 minutes in a gravity displacement steam sterilizer] is <b>not recommended for implantable items</b>.</li> </ul>
<b>Biological Monitoring of Sterilizers</b>	<ul style="list-style-type: none"> <li>• All sterilizers should be monitored at least <u>once a week</u> with commercial preparations of spores intended specifically for that type of sterilizer (i.e., Bacillus stearothermophilus for steam sterilizers and Bacillus subtilis for ethylene oxide and dry heat sterilizers).</li> <li>• <u>Every load that contains implantable objects</u> should be monitored. These implantable objects should not be used until the spore test is found to be negative at 48 hours.</li> <li>• If spores are not killed in routine spore tests, the sterilizer should immediately be checked for proper use and function and the spore test repeated. Objects, other than implantable objects, do not need to be recalled because of a single positive spore test unless the sterilizer or the sterilization procedure is defective.</li> <li>• If spore tests remain positive, use of the sterilizer should be discontinued until it is serviced.</li> </ul>
<b>Use and Preventive Maintenance</b>	Manufacturer's instructions should be followed for use and maintenance of sterilizers.
<b>Chemical Indicators</b>	Chemical indicators that will show a package has been through a sterilization cycle should be visible on the outside of each package sterilized.
<b>Use of Sterile Items</b>	An item should not be used if its sterility is questionable, e.g., its package is punctured, torn, or wet.
<b>Reprocessing Single-Use or Disposable Items</b>	<ul style="list-style-type: none"> <li>• Items or devices that cannot be cleaned and sterilized or disinfected without altering their physical integrity and function should not be reprocessed.</li> <li>• Reprocessing procedures that result in residual toxicity or compromise the overall safety or effectiveness of the items or devices should be avoided.</li> </ul>

- **Role of CSSD (Central sterile services department):**

Rinsing, Cleaning, Drying, Inspection and assembly, Packaging, Labelling, Sterilisation, Storage, Distribution



## Summary

<b>Cross Contamination</b>	Transmission of microorganisms from patient to patient and from inanimate objects to patients .
<b>Asepsis</b>	Absence of microorganism that cause disease.
<b>Best technique for you to use when rinsing your hands and forearms after a surgical scrub</b>	Rinsing should start with the hand positioned such that the water runs off the elbow rather than down to the hands.

- **Sterilization:** is the destruction of all forms of microbial life.
- Proper aseptic techniques are one of the most fundamental and essential principles of infection control in the clinical and surgical setting (**prevent surgical site infections**).
- Destruction of the integrity of the microbial barriers results in contamination.
- All surgical scrubs are 3-5 minutes in length.

- **Aseptic Techniques:**

Methods by which contamination with microorganisms is prevented:

- 1-Hand washing.
- 2.Surgical attire (e.g. sterile gowning and gloving).
3. Surgical scrubs.
4. Patient surgical skin prep.
5. Using surgical barriers (surgical drapes).
6. Using safe operative techniques.

- **Types of disinfection:**

### 1-Low-level disinfection:

can kill most bacteria, some viruses, and some fungi; cannot be relied on to kill resistant microorganisms such as tubercle bacilli or bacterial spores.

### 2-Intermediate disinfection:

inactivates Mycobacterium tuberculosis, vegetative bacteria, most viruses, and most fungi; does not necessarily kill bacterial spores.

### 3-High-level disinfection:

can be expected to **destroy all microorganisms, with the exception of large numbers of bacterial spores.**

**Medical devices and equipments are divided into three general categories:**

1. Critical items	2. Semicritical items	3. Noncritical items
<ul style="list-style-type: none"> <li>● Examples are surgical instruments, cardiac catheters, implants, pertinent components of the heart-lung oxygenator, and the blood compartment of a hemodialyzer.</li> </ul>	<ul style="list-style-type: none"> <li>● Examples are noninvasive flexible and rigid fiberoptic endoscopes, endotracheal tubes, anesthesia breathing circuits, and cystoscopes.</li> </ul>	<ul style="list-style-type: none"> <li>● Such items include stethoscopes, crutches, bedboards, blood pressure cuffs, and a variety of other medical accessories.</li> </ul>



## Questions:

**1. The definition of asepsis is:**

- A. Soiled or infected with organisms.
- B. Capable of producing disease.
- C. Absence of microorganisms.

**2. Cross contamination is defined as:**

- A. Producing or capable of producing disease.
- B. Transmission of microorganisms from patient to patient and from inanimate objects to patients.
- C. Severe toxic state resulting from infection with pyogenic organisms.

**3. Which is the best technique for you to use when rinsing your hands and forearms after a surgical scrub?**

- A. Rinsing is not performed after a surgical scrub because it will reduce the antimicrobial activity of the cleansing solution.
- B. Rinsing should start at the elbow with the water running down back down to the hand.
- C. Rinsing should start with the hand positioned such that the water runs off the elbow rather than down to the hands.

**4. Despite the antimicrobial component of the scrub process:**

- A. Skin is always sterile.
- B. Skin is never sterile.
- C. Skin is sterile after scrub process.

**5. Gowns are only sterile from:**

- A. From waist to shoulder.
- B. From chest to knees.
- C. From waist to knees.

Answers:

1: C 2: B 3: C 4: B 5: A