



Operating Room Orientation for Medical Students

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Objectives



★ At the end of the session, you will be able to:



1. Acquaint with the set up in the operating room.
2. Describe the fundamental principles of aseptic techniques in the OR
3. Demonstrate the correct technique of the surgical scrub, gowning and gloving technique.
4. Explain the importance of time out process.
5. Familiarize the sterilization procedures





Pre-Test Questions – Question #1

1. The definition of asepsis is:

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



Answer

1. The definition of asepsis is:

A. Soiled or infected with organisms

B. Capable of producing disease

C. Absence of microorganisms



Question #2

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



Answer

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



Question # 3

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



Answer

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.

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KKUH Operating Room

- ★ Upon entering basic rules and policy like surgical attire.
- ★ How many theaters?
- ★ Specialty and schedules
- ★ Administrators





KKUH Operating Room





KKUH Operating Room





KKUH Operating Room





KKUH Operating Room





Introduction to Sterile Technique



- Proper aseptic techniques is one of the most fundamental and essential principles of infection control in the clinical and surgical setting
- Aseptic Techniques are those which:
 - Remove/reduce or kill microorganisms from hands and objects
 - Employ sterile instruments
 - Reduce patient risk of exposure to microorganisms that cannot be removed



Aseptic Technique

- Immediately before and during surgical procedures to reduce post-operative infection:
 - Hand washing
 - Surgical Attire
 - Surgical scrub, sterile gowning & gloving
 - Patients surgical skin prep
 - Using surgical barriers (surgical drapes and PPE)
 - Using safe operative technique





Asepsis

- ★ Absence of microorganism that cause disease
- ★ Freedom from infection
- ★ Aseptic Technique = methods by which contamination with microorganisms is prevented





Principles of Aseptic Technique



★ Only sterile items are used within the sterile field

★ Sterile persons are gowned and gloved

– Gowns are only sterile from waist to shoulder

– Gloved hand must be kept in sight at all times



★ Only the top of a draped table is considered sterile



★ Sterile persons touch only sterile items or areas



Principles of Aseptic Technique



★ Unsterile persons avoid reaching over the sterile field



★ The edges of anything that encloses sterile contents are considered unsterile



★ Sterile field is created as close as possible to the time of use

★ Sterile areas are continuously kept in view



Principles of Aseptic Technique



- ★ Sterile persons keep well within the sterile area
- ★ Sterile persons keep contact with sterile areas to a minimum
- ★ Unsterile persons avoid sterile areas
- ★ Destruction of the integrity of microbial barriers results in contamination





The Surgical Hand Antisepsis

- ★ 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 chemical antimicrobial component of the scrub process, skin is never sterile





Surgical Hand Antisepsis

★ 4 factors affecting the effectiveness of surgical hand antisepsis:

- The preparation before cleansing
- The choice of antiseptic solution
- The cleansing method
- The duration for hand cleansing





Choice of Antiseptic Solution



★ Antimicrobial soaps, aqueous scrubs (ex. biguanides), alcohol rubs used as antiseptic solutions+



★ Alcoholic chlorhexidine was found to have greater residual antimicrobial activity

- Review by Tanner et al, reported that biguanides (ex Chlorohexidine gluconate are more effective in removing microorganism on hands than Iodophors (ex. Providone iodine)





The Methodology of the Scrub

★ The time method:

- All surgical scrubs are 3-5 minutes in length
- All are performed using a surgical scrub brush and an antimicrobial soap solution





Preparation Before Surgical Scrub



★ Removal of finger rings/jewelry, nail polish and artificial nails



– Finger rings and jewelry can harbor microorganism and dead skin



– Dark nail polish obscures the subungual space and likelihood of careful cleansing is reduced

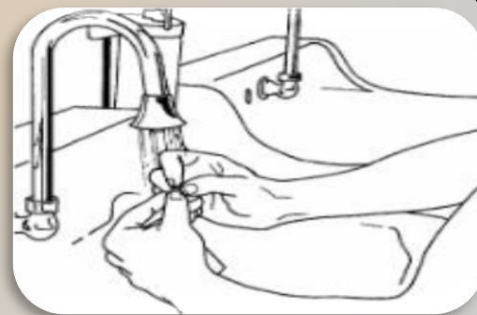
– Artificial nail ↑ the microbial load on hands



Preparation Before Surgical Scrub



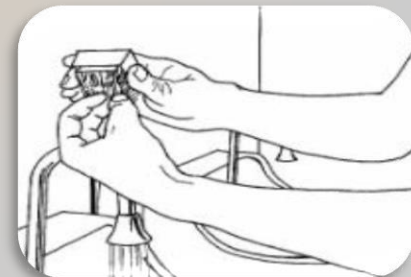
- ★ Perform a preliminary hand washing with antimicrobial soap
- ★ Wash both of your hands and arms, lathering up well
 - Rinse and dry
- ★ Clean underneath your fingernails with a nail file





Surgical Scrub Procedure

- ★ 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 brush scrub the spaces under the fingernails of the right or left hand with 30 circular strokes





Surgical Scrub Procedure



- ★ 3. Lather digits; scrub 20 circular strokes on all four sides of each finger

- ★ 4. Lather palm, back of hand, heel of hand and space between thumb and index finger (scrub 20 circular strokes) on each surface





Surgical Scrub Procedure



- ★ 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 wrist
 - Then move up the forearm – lather, then scrub ending 2 inches above the elbow



Surgical Scrub Procedure



★ 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



Surgical Scrub Procedure



- ★ 8. After final rinse, turn water off and keep scrubbed hands and arms in view to avoid contamination and back into operating room
- ★ 9. In the operating room, dry hands and arms with a sterile towel before donning a sterile surgical gown and gloves



Drying the Hands

- 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 2: Open the towel full-length, holding one end away from the non-sterile scrub attire
 - Bend slightly forward





Drying the Hands



- Step 3: Dry both hands thoroughly but independently
 - To dry one arm, hold the towel in the opposite hand and, using the oscillating motion of the arm, draw the towel up to the elbow
- 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



- ★ Step 1: Reach down to the sterile package and lift the folded gown directly upward
- ★ Step 2: Step back away from the table into an unobstructed area to provide a wide margin of safety while gowning
- ★ Step 3: Holding the folded gown, carefully locate the neckline



Gowning Technique



- 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 toward the body
 - **Do not touch the outside of the gown with bare hands → the gown is considered contaminated**
- Step 5: Holding the hands at shoulder level, slip both arms into the armholes simultaneously



Gowning Technique

- The circulator brings the gown over the shoulders by reaching inside to the shoulder 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





Gowning Technique

★ Summary Principles:

- Touch only the inside of the gown while donning it
- If touch the outside, the 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 waist level to a few inches below neck opening





Gowning





Gloving by the Closed Glove Technique



- ★ Preferred method over open-gloving technique
- ★ Provides a bacterial barrier between patient and surgeon
- ★ Step1: Using the right 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



Gloving by the Closed Glove Technique



- ★ 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 and the thumb of the glove is down





Gloving by the Closed Glove Technique



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





Gloving by the Closed Glove Technique



- ★ 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

Step 1



Step 2



<http://www.brooksidepress.org>

Step 3



Step 4





Final Tie of the Gown



Before induction of anaesthesia ▶▶▶▶▶▶▶▶ **Before skin incision** ▶▶▶▶▶▶▶▶▶▶▶▶▶▶ **Before patient leaves operating room**

SIGN IN

- PATIENT HAS CONFIRMED
 - IDENTITY
 - SITE
 - PROCEDURE
 - CONSENT

- SITE MARKED/NOT APPLICABLE

- ANAESTHESIA SAFETY CHECK COMPLETED

- PULSE OXIMETER ON PATIENT AND FUNCTIONING

- DOES PATIENT HAVE A:
 - KNOWN ALLERGY?
 - NO
 - YES
 - DIFFICULT AIRWAY/ASPIRATION RISK?
 - NO
 - YES, AND EQUIPMENT/ASSISTANCE AVAILABLE
 - RISK OF >500ML BLOOD LOSS (7ML/KG IN CHILDREN)?
 - NO
 - YES, AND ADEQUATE INTRAVENOUS ACCESS AND FLUIDS PLANNED

TIME OUT

- CONFIRM ALL TEAM MEMBERS HAVE INTRODUCED THEMSELVES BY NAME AND ROLE

- SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE VERBALLY CONFIRM
 - PATIENT
 - SITE
 - PROCEDURE

- ANTICIPATED CRITICAL EVENTS
 - SURGEON REVIEWS: WHAT ARE THE CRITICAL OR UNEXPECTED STEPS, OPERATIVE DURATION, ANTICIPATED BLOOD LOSS?
 - ANAESTHESIA TEAM REVIEWS: ARE THERE ANY PATIENT-SPECIFIC CONCERNS?
 - NURSING TEAM REVIEWS: HAS STERILITY (INCLUDING INDICATOR RESULTS) BEEN CONFIRMED? ARE THERE EQUIPMENT ISSUES OR ANY CONCERNS?

- HAS ANTIBIOTIC PROPHYLAXIS BEEN GIVEN WITHIN THE LAST 60 MINUTES?
 - YES
 - NOT APPLICABLE

- IS ESSENTIAL IMAGING DISPLAYED?
 - YES
 - NOT APPLICABLE

SIGN OUT

- NURSE VERBALLY CONFIRMS WITH THE TEAM:
 - THE NAME OF THE PROCEDURE RECORDED
 - THAT INSTRUMENT, SPONGE AND NEEDLE COUNTS ARE CORRECT (OR NOT APPLICABLE)
 - HOW THE SPECIMEN IS LABELLED (INCLUDING PATIENT NAME)
 - WHETHER THERE ARE ANY EQUIPMENT PROBLEMS TO BE ADDRESSED

- SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE REVIEW THE KEY CONCERNS FOR RECOVERY AND MANAGEMENT OF THIS PATIENT

Disinfection and Sterilization





Definition of terms

- ★ **Cleaning** - the physical removal of organic material or soil from objects, is usually done by using water with or without detergents.
- ★ **Sterilization** is the destruction of all forms of microbial life; it is carried out in the hospital with steam under pressure, liquid or gaseous chemicals, or dry heat.
- ★ **Disinfection**, defined as the intermediate measures between physical cleaning and sterilization.





The level of disinfection achieved depends on several factors:

- ★ contact time
- ★ temperature
- ★ type and concentration of the active ingredients of the chemical germicide
- ★ the nature of the microbial contamination.



Types of disinfection

- ★ ***High-level disinfection***: can be expected to destroy all microorganisms, with the exception of large numbers of bacterial spores.
- ★ ***Intermediate disinfection***: inactivates *Mycobacterium tuberculosis*, vegetative bacteria, most viruses, and most fungi; does not necessarily kill bacterial spores.
- ★ ***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.





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

-
- critical items
 - semicritical items
 - noncritical items



Critical items



★ Critical items are instruments or objects that are introduced directly into the bloodstream or into other normally sterile areas of the body.

Examples are surgical instruments, cardiac catheters, implants, pertinent components of the heart-lung oxygenator, and the blood compartment of a hemodialyzer.

Sterility at the time of use is required for these items; consequently, one of several accepted sterilization procedures is generally recommended.



Semicritical items



- ★ These items come in contact with intact mucous membranes, but they do not ordinarily penetrate body surfaces.

Examples are noninvasive flexible and rigid fiberoptic endoscopes, endotracheal tubes, anesthesia breathing circuits, and cystoscopes.

Sterilization is not absolutely essential; at a minimum, a high-level disinfection procedure that can be expected to destroy vegetative microorganisms, most fungal spores, tubercle bacilli, and small nonlipid viruses is recommended. 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.



Noncritical items

- ★ Noncritical items are those that either do not ordinarily touch the patient or touch only intact skin.

Such items include crutches, bedboards, blood pressure cuffs, and a variety of other medical accessories.

These items rarely, if ever, transmit disease. Consequently, washing with a detergent may be sufficient.





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- ★ **Items must be thoroughly cleaned** before processing, because organic material (e.g., blood and proteins) may contain high concentrations of microorganisms. Also, such organic material may inactivate chemical germicides and protect microorganisms from the disinfection or sterilization process.



For noncritical items

cleaning can consist only of

- 1) washing with a detergent or a disinfectant-detergent,
- 2) rinsing,
- 3) thorough drying.





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.
- ★ Items that are to be sterilized but not used immediately need to be wrapped for storage.
- ★ Sterility can be maintained in storage for various lengths of time, depending on the type of wrapping material, the conditions of storage, and the integrity of the package.





Monitoring of steam sterilization processes



- ★ to check the highest temperature that is reached during sterilization and the length of time that this temperature is maintained
- ★ heat- and steam-sensitive chemical indicators can be used on the outside of each pack
- ★ a large pack might have a chemical indicator both on the outside and the inside to verify that steam has penetrated the pack



Microbiological monitoring



- ★ Microbiological monitoring of steam sterilizers is recommended at least *once a week* with commercial preparations of spores of *Bacillus stearothermophilus* (a microorganism having spores that are particularly resistant to moist heat, thus assuring a wide margin of safety).

One positive spore test (spores not killed) does not necessarily indicate that items processed in the sterilizer are not sterile, but it does suggest that the sterilizer should be rechecked for proper temperature, length of cycle, loading, and use and that the test be repeated.



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.





Ethylene oxide gas sterilization



- ★ It is a more complex and 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.



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- ★ Because ethylene oxide gas is toxic, precautions (e.g., local exhaust ventilation) should be taken to protect personnel. All objects processed by gas sterilization also need special aeration according to manufacturer's recommendations before use to remove toxic residues of ethylene oxide.
 - ★ Chemical indicators need to be used with each package to show that it has been exposed to the gas sterilization process.
 - ★ Moreover, it is recommended that gas sterilizers be checked at least once a week with commercial preparations of spores, usually *Bacillus subtilis*.



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- ★ Powders and anhydrous oils can be sterilized by **dry heat**. Microbiological monitoring of dry heat sterilizers usually provides a wide margin of safety for dry heat sterilization.
 - ★ **Liquid chemicals** can be used for sterilization and disinfection when steam, gas, or dry heat sterilization is not indicated or available



The most **appropriate chemical germicide** for a particular situation can be selected by responsible personnel in each hospital based on

- the object to be disinfected,
- the level of disinfection needed,
- and the scope of services, physical facilities, and personnel available in the hospital.



★ **Gloves** may be indicated to prevent skin reactions when some chemical disinfectants are used.

Items subjected to high-level disinfection with liquid chemicals need to be rinsed in sterile water to remove toxic or irritating residues and then thoroughly dried.

Subsequently, the objects need to be handled aseptically with sterile gloves and towels and stored in protective wrappers to prevent recontamination.



Recommendations

★ Cleaning

All objects to be disinfected or sterilized should first be thoroughly cleaned to remove all organic matter (blood and tissue) and other residue.

★ Indications for Sterilization and High-Level Disinfection

- 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 sterilization procedure before each use.
- Laparoscopes, arthroscopes, and other scopes that enter normally sterile tissue should be subjected to a sterilization procedure before each use; if this is not feasible, they should receive at least high-level disinfection.





- ★ Equipment that touches *mucous membranes*, e.g., endoscopes, endotracheal tubes, anesthesia breathing circuits, and respiratory therapy equipment, should receive high-level disinfection.
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★ **Methods of Sterilization**

- Whenever sterilization is indicated, a steam sterilizer should be used unless the object to be sterilized will be damaged by heat, pressure, or moisture or is otherwise inappropriate for steam sterilization. In this case, another acceptable method of sterilization should be used.
- Flash sterilization [270°F (132°C) for 3 minutes in a gravity displacement steam sterilizer] is not recommended for implantable items.





★ Biological Monitoring of Sterilizers

- All sterilizers should be monitored at least once a week 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).
- Every load that contains implantable objects should be monitored. These implantable objects should not be used until the spore test is found to be negative at 48 hours.



★ **Biological Monitoring of Sterilizers**

- 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.
- If spore tests remain positive, use of the sterilizer should be discontinued until it is serviced.



★ Use and Preventive Maintenance

- Manufacturers' instructions should be followed for use and maintenance of sterilizers.

★ Chemical Indicators

- Chemical indicators that will show a package has been through a sterilization cycle should be visible on the outside of each package sterilized.



★ Use of Sterile Items

- An item should not be used if its sterility is questionable, e.g., its package is punctured, torn, or wet.

★ Reprocessing Single-Use or Disposable Items

- Items or devices that cannot be cleaned and sterilized or disinfected without altering their physical integrity and function should not be reprocessed.
- Reprocessing procedures that result in residual toxicity or compromise the overall safety or effectiveness of the items or devices should be avoided.



Role of CSSD



- ★ Rinsing
- ★ Cleaning
- ★ Drying
- ★ Inspection and assembly
- ★ Packaging
- ★ Labelling
- ★ Sterilisation
- ★ Storage
- ★ Distribution



Summary

- ★ Proper aseptic technique is one of the most fundamental and essential principles of infection control
- ★ This stepwise process of proper aseptic technique should be performed every single time in the OR





★ Thank you very much