



Infection Prevention Training for Outpatient Healthcare Settings

Module F- Principles of Disinfection and Sterilization HANDOUT

Rev 2023

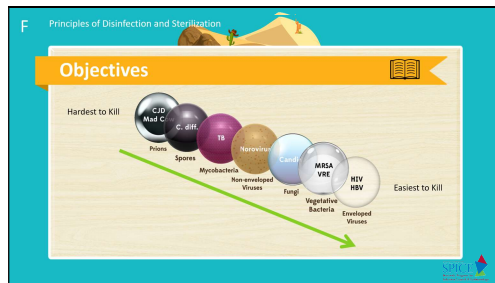
Slide 1



Slide 2



Slide 3



Slide 4

F Principles of Disinfection and Sterilization

Principles

Decontamination

Packaging

- Inspecting
- Assembling
- Packaging

Sterilize

- Sterilizers/supplies
- Incubators
- Enclosed storage

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Surgical Process Improvement and Control

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F Principles of Disinfection and Sterilization

Principles

Management of reusable contaminated items:

- Handle as little as possible
- Use appropriate PPE
- Remove gross soil or debris at the point of use (gauze sponge moistened with water/disinfectant wipe for example)
- Immediately contain and transport to the decontamination area or soiled utility room where cleaning procedures can be accomplished away from patient care

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Principles

Transport of contaminated items:

- Must be contained. The type of container depends on the item being transported:
 - Puncture-resistant, leak-proof, closable containers must be used for devices with edges or points capable of penetrating container or skin
 - Must have a bio-hazard label or be red in color (never via gloved hands alone)
- Items should be kept moist during transport by adding a towel moistened with water (not saline) or a foam, spray or gel product specifically intended for this use
- Avoid transporting contaminated items in a liquid
- Reusable collection containers for holding contaminated items should be made of material that can be effectively decontaminated
- Use separate collection containers for contaminated versus re-processed or clean items

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Principles

Factors influencing the efficacy of disinfection and sterilization

- How well the object is cleaned/type and amount of material
- Testing of the disinfectant
 - Solution concentration
 - Exposure time
- Design of object
- Temperature and pH of disinfectant

Slide 8

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Cleaning Instruments - Manual

Medical equipment cleaned prior to sterilization. Contaminants such as body fluids, if present, must be removed.

Use disinfectants according to manufacturers' instructions for use

Video link

<https://vimeo.com/835591319/45e32f16b2?share=copy>

Slide 9

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Cleaning Instruments - Automated

Automated cleaning equipment

- Ultrasonic cleaner
- Instrument washer
- FDA regulated instrument washer

Benefits:

- Improve efficacy of cleaning process
- Reduce handling of sharp instruments
- Reduce risk of employee exposure

Follow manufacturer's recommendations:

- Dilution
- Temperature
- Water hardness
- Use

After cleaning, rinse with water


Slide 10

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Knowledge Check

Which of the following statements is true?

- A. Manual cleaning of objects is safer than automated cleaning
- ✓ B. Pre-cleaning is the most important factor in reprocessing objects
- C. Objects do not need to be pre-cleaned if they are going to be sterilized
- D. Household dishwashers can be used for pre-cleaning of instruments.



Slide 11

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Methods Used for Disinfection and Sterilization




Slide 12

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Spaulding Classification

Spaulding Classification of Surfaces:

- **Critical** – Objects which enter normally sterile tissue or the vascular system and require sterilization
- **Semi-critical** – Objects that contact mucous membranes or non-intact skin and require high-level disinfection, which kills all but high-levels of bacterial spores
- **Non-critical** – Objects that contact intact skin but not mucous membranes, and require low-level disinfection



Slide 13

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Processing Critical Instruments

Critical Items:

- Penetrate or enter normally sterile tissue or spaces, including the vascular system (Surgical instruments, cardiac catheters, IV devices, urinary catheters)
- High risk of transmitting infection if handled improperly
- Must be sterilized between uses or used as single-use disposable devices

Goal: Sterility = devoid of all microbial life

Slide 14

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Processing Critical Instruments

Four activities involved in the sterilization and disinfection of critical objects

- Sterilization/Disinfection (Steam, dry heat, liquid chemical)
- Monitoring
- Packaging (Wrapping, record keeping, loading)
- Storage

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Sterilization

- Steam sterilization (most common in OP setting)
- Hydrogen peroxide gas plasma
 - Ethylene oxide
 - Ozone
- Vaporized hydrogen peroxide
 - Steam formaldehyde

• high temperature
• low temperature

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Steam Sterilization



Advantages


- Non-toxic
- Cycle easy to control and monitor
- Inexpensive
- Rapidly microbicidal
- Rapid cycle time
- Least affected by organic/inorganic soils
- Penetrates medical packing, device lumens

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Steam Sterilization



Disadvantages

- Deleterious for heat labile instruments
- Inappropriate for heat-sensitive instruments
- Inappropriate for moisture-sensitive instruments
- Dulling
- Rusting
- Potential for burns

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Steam Sterilization

Steam under pressure (autoclaving)

2 types of steam sterilization

- Gravity displacement:
 - Exposure: 30 minutes
 - Temperature: 121°C
- Pre-vacuum:
 - Exposure: 4 minutes
 - Temperature: 132°C



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Dry Heat Sterilization

- Transfers heat energy from air inside the oven to the instruments
- Requires higher temperatures
- Good for items that are likely to dull or rust in the autoclave
- Good for powders, cellulose and ink
- Packaging must be able to withstand high temperatures



Sterilization

Slide 20

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Liquid Chemical Sterilants/Disinfectants



- Only for heat-sensitive critical and semi-critical devices
- Exposure can be harmful to providers and patients
- Can not be stored
- Heat tolerant or disposable alternatives are available

Sterilization

Slide 21

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Sterilization Review

- Steam is preferred for critical items not damaged by heat
- Follow the operating parameters recommended by the manufacturer
- Use low temperature sterilization technologies for reprocessing critical items damaged by heat
- Items immersed in chemo-sterilizer solutions should be used immediately

Sterilization

Slide 22

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Knowledge Check

Patient care equipment and devices should be disinfected/sterilized based on:

1. Items intended use
2. What the item is going to come in contact with (mucous membranes or non-intact skin)
3. The number of patients you have scheduled for the day
4. What the physician tells you to do

Choose


- A. 1 and 4
- B. 2 and 4
- C. 1 and 2
- D. 3 and 4




Slide 23

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Monitoring



- Centers for Medicare and Medicaid Services (CMS)
- 10A NCAC 41.0206 (NC Rule .0206)
- The Joint Commission (TJC)





Slide 24

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Sterilization Monitoring

Sterilization monitored routinely by combination of physical, chemical, and biological parameters


- **Physical** - cycle time, temperature, pressure
- **Chemical** - heat or chemical sensitive inks that change color when germicidal-related parameters reached
- **Biological** - Bacillus spores that directly measure sterilization



Slide 25

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Monitoring Of Sterilizers



Internal Chemical Indicator

- Validates the sterilant penetrated the pack or tray
- Advantage of the pack control monitor is that it is inside each pack in multiple locations
- Detect local problem

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Monitoring Of Sterilizers

Biological Monitors

- Steam
Geobacillus stearothermophilus
- Dry heat
B. atrophaeus (formerly *B. subtilis*)
- Ethylene oxide (ETO)
B. atrophaeus



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Monitoring of Sterilizers

IF biological indicator is positive (after sterilization cycle)

 = 

Follow CDC and AORN procedures





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Monitoring of Sterilizers

After single 

→

- Remove 
- Retest 
- Recall implantable items 



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Monitoring of Sterilizers

Next test 

→

- Return to service 



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Monitoring of Sterilizers

Next test 

→

- Do not use until inspected 
- Run 3X
- Reprocess
- Recall items if still positive
- Defective procedures possible



Slide 28

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Monitoring of Sterilizers

Steam sterilization

If patient care items were used before retrieval, the infection preventionist should assess the risk of infection in collaboration with the physician, and if needed, consult an outside reprocessing specialist.



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Monitoring of Sterilizers

Steam sterilization

There is a minimal risk associated with items in a load that show spore growth, especially if the item was properly cleaned and the time, temperature and pressure was achieved (as demonstrated by a chemical indicator and monitoring documentation).

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Monitoring of Sterilizers

Other Sterilization Methods

After single +



- Treat as non-sterile all items that have been processed in that sterilizer, dating from the last sterilization cycle in which there was a negative biological indicator.
- Retrieve the items and reprocess.

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Monitoring Review

- Monitor each load with physical and chemical (internal and external) indicators.
- Use biological indicators to monitor effectiveness of sterilizers at least weekly with spores intended for the type of sterilizer.
- Use biological indicators for every load containing implantable items
- Policy for management of positive BI indicator

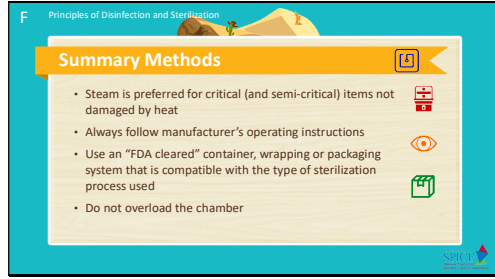
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Slide 33

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Summary Methods

- Steam is preferred for critical (and semi-critical) items not damaged by heat
- Always follow manufacturer's operating instructions
- Use an "FDA cleared" container, wrapping or packaging system that is compatible with the type of sterilization process used
- Do not overload the chamber



Slide 34

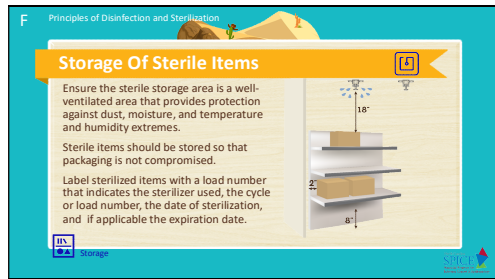
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Storage Of Sterile Items

Ensure the sterile storage area is a well-ventilated area that provides protection against dust, moisture, and temperature and humidity extremes.

Sterile items should be stored so that packaging is not compromised.

Label sterilized items with a load number that indicates the sterilizer used, the cycle or load number, the date of sterilization, and if applicable the expiration date.



Slide 35

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Storage Of Sterile Items

Shelf life =

- **Event-related** shelf life recognizes that the product remains sterile until an event causes it to become contaminated (e.g. moisture).
- Packages should be evaluated before use for loss of integrity. Repack and reprocess if compromised.
- If **time related** storage of sterile items is used, label the pack at the time of sterilization with an expiration date. Once this date expires, reprocess the pack.



Slide 45

Agent	Use Concentration
Ethyl or isopropyl alcohol	70% - 90%
Chlorine (bleach)	100 ppm
Phenolic	UD
Iodophor	UD
Quaternary ammonium compound (QUAT)	UD
Improved/Accelerated hydrogen peroxide	0.5%, 1.4%
Non-critical	UD = Manufacturer's recommended use dilution

Slide 46

- Broad Spectrum
 - Fast Acting
 - Non-Toxic
 - Surface Compatibility
 - Easy to Use
 - Acceptable odor
 - Economical
- Non-critical

Slide 47

- Blood and Body Fluid Spills**
- Contaminated work surfaces shall be decontaminated with an appropriate disinfectant
 - After completion of procedures
 - Immediately or as soon as feasible when surfaces are overtly contaminated
 - After any spill of blood or other potentially infectious materials
 - At the end of the work shift if the surface may have become contaminated since the last cleaning
 - When there are large spills of blood and/or body fluids it is important to clean or remove the spill prior to disinfecting the area
 - The first step is to clean and decontaminate the area promptly
 - If the spill contains large amounts of blood or body fluids, clean the visible matter with disposable absorbent materials and discard the contaminated materials in appropriate, labeled container (treat as OSHA regulated medical waste)
 - Use EPA-registered disinfectants labeled tuberculocidal or EPA registered germicides with specific label claims for HIV or hepatitis B virus (HBV) in accordance with label instructions to decontaminate spills of blood and other body fluids



Slide 48

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Knowledge Check

Contaminated reusable items should be:

1. Handled as little as possible
2. Placed in a bio-hazard labeled container and left in room until end of the workday
3. Pre-cleaned in sink in the exam room
4. Transported immediately after use and not left in the patient care area

Choose

- A. 1 and 3
- B. 3 and 4
- C. 1 and 4
- D. 1, 2, 3, 4



Slide 49



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Training and Quality Control

Provide comprehensive and intensive training for all staff assigned to reprocess medical/surgical instruments

To achieve and maintain competency:

- Staff receive hands-on training
- Work with supervision until competency is documented
- Competency testing should be conducted at commencement of employment and no less than annually
- Training and competencies should be documented




Slide 50

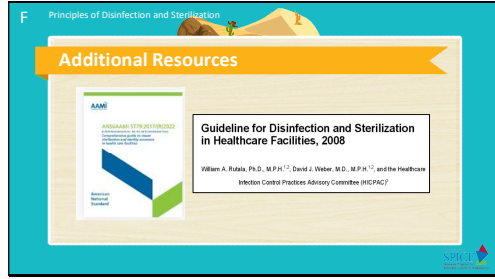
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Training and Quality Control

- Conduct infection control rounds no less than annually and more often if high risk area (GI clinic, Urology, Endoscopy)
- Ensure all products used for disinfection and/or sterilization have been approved by infection prevention
- Follow manufacturer instructions for use (IFUs) for preparation and packing of items



Slide 51



Slide 52