HEALTH TECH ACADEMY

Decontamination, Sterilization, and Disinfection

Diagnostics, Infection Control and Sterilization

Lesson Objectives:

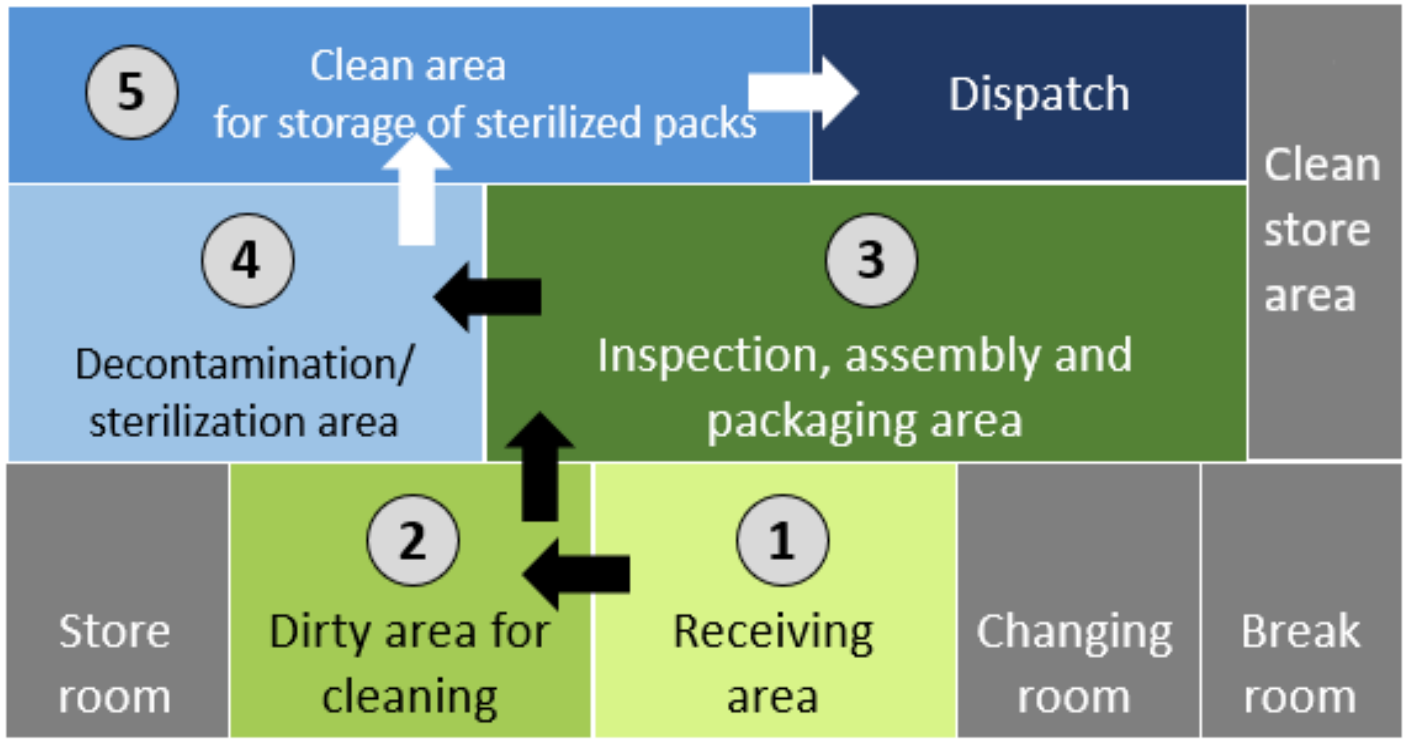
1. Terms related to disinfection and sterilization
2. Explain the Spaulding system of classification
3. Describe the steps of reprocessing surgical instruments from the point of use to sterilization
4. Discuss the principles and processes of decontamination
5. Describe special processing required for instruments exposed to Creutzfeldt–Jakob disease
6. Distinguish between disinfection and sterilization
7. Recognize the hazards associated with the use of chemical disinfectants
8. Describe terminal cleaning of the operating room environment

Standards and Regulations for Sterilization and Disinfection

- Association for the Advancement of Medical Instrumentation (AAMI)
- Association of perioperative Registered Nurses (AORN)
- Association of Surgical Technologists (AST)
- Centers for Disease Control and Prevention–Healthcare Infection Control Practices Advisory Committee (CDC-HICPAC)
- ECRI Institute
- The Joint Commission (TJC)
- U.S. Food and Drug Administration (FDA)

Important Terms

- Antiseptic
- Bacteriostatic
- Bioburden
- Biofilm
- Contaminated
- Cleaning
- Disinfection
- Reprocessing
- Sterilization
- Terminal cleaning
- Terminal decontamination



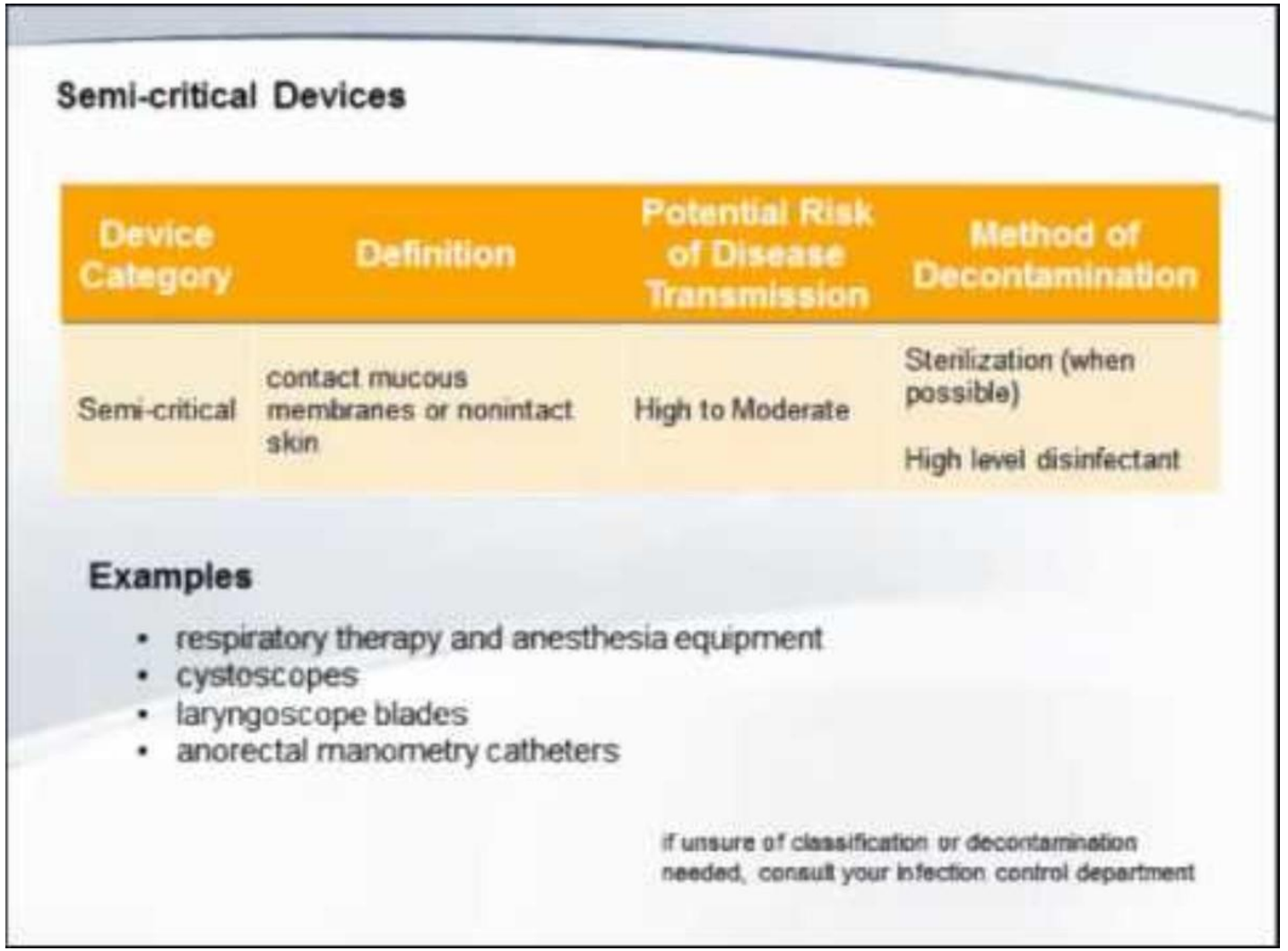
Spaulding Classification System

- The Spaulding system – a way to determine if a patient care device requires sterilization, disinfection, or cleaning (washing)

- **Classifications**:
  - High risk – critical items
    - Sterile body tissues including the vascular system
  - Intermediate risk – semi-critical items
    - Mucous membranes and non-intact skin
  - Low risk - noncritical items
    - Intact skin

Watch the "Spaulding Classification" Video for an overview

Spaulding Classification Video



Spaulding Classification Video

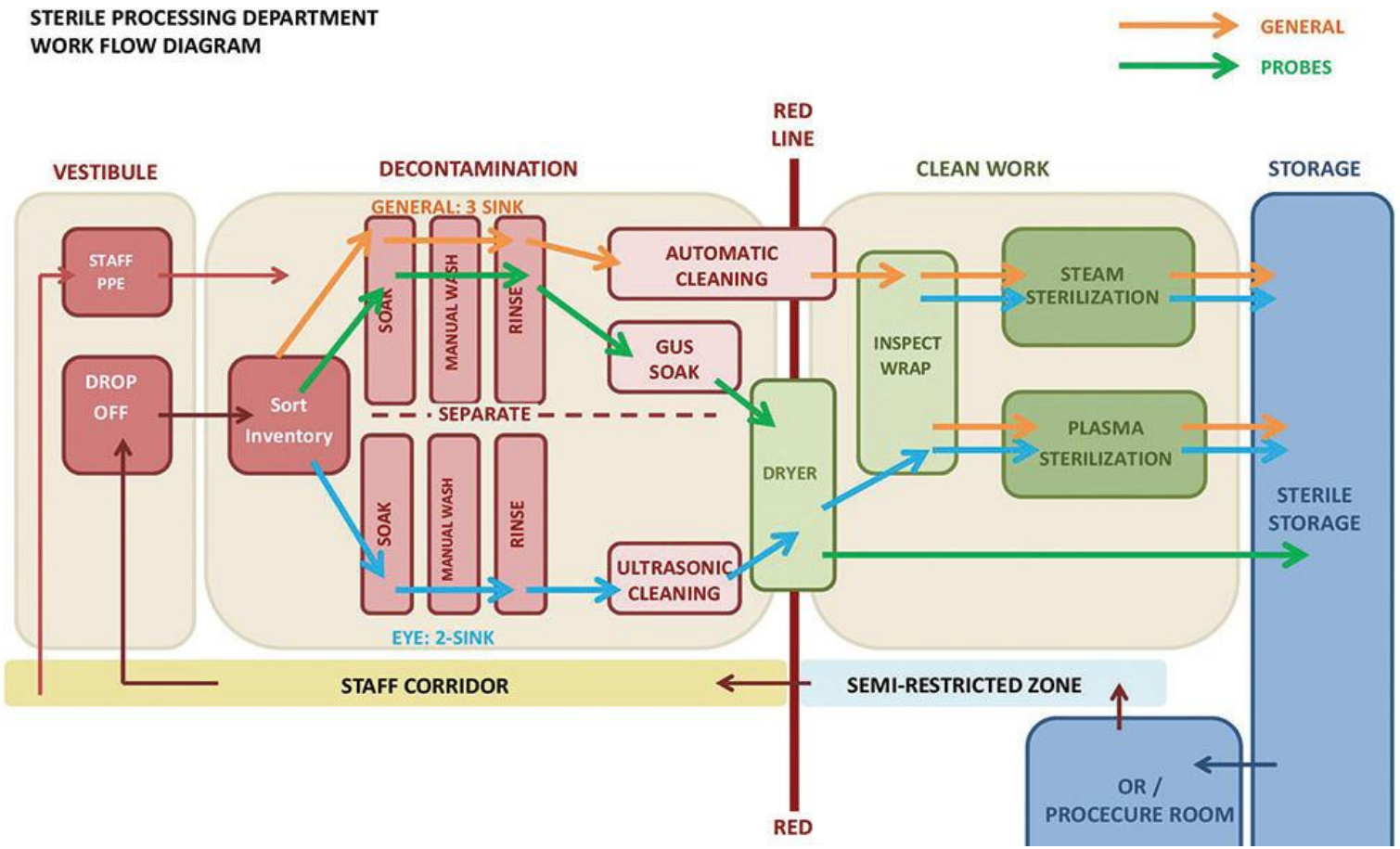
Summary of Video:

- Critical Items: High Risk of Infection
  - Contacts Blood, Inner Body Tissues, or Body Space
  - Sterilization
- Semi-Critical: High to Moderate Risk of Infection
  - Contacts Mucous membranes and non-intact skin
  - High Level Disinfection or Sterilization (When Possible)
- Non-Critical Items: Low Risk of Infection
  - Contacts Intact skin without penetration
  - Intermediate to low level disinfection and cleaning

Sterile Processing Department

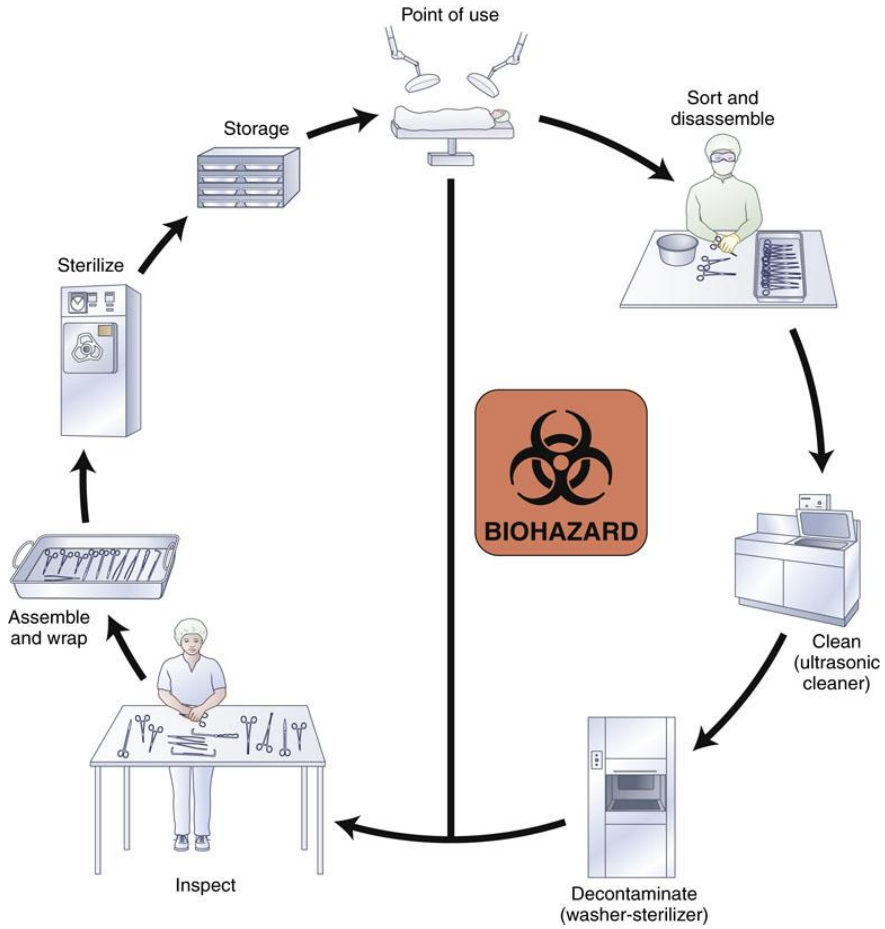
- **Sterile Processing Department (SPD):**
  - Responsible for high volume reprocessing.
  - Staffed by sterile processing technicians.
  - Requires expertise in materials management, decontamination, sterilization.
- **Reprocessing Coordination:**
  - Instruments transferred to SPD for reprocessing.
  - Coordination between perioperative personnel and SPD staff crucial.
  - Thousands of instruments organized and processed to standards.
- **Critical Work:**
  - Focus on disease prevention and safety for patients and staff.
  - Understanding the critical nature of their roles in both departments.

Sterile Processing Department



The Reprocessing Cycle

- Step-by-step procedure that follows an exact protocol
- Starts at the point of use in surgery
- Ends with equipment that is ready and safe for the surgical patient
- **Includes:**
  - Point-of-use cleaning
  - Sorting and disassembly
  - Cleaning the instruments
  - Decontamination
  - Sorting and inspection
  - Assembly
  - Wrapping
  - Storage



Cleaning Instruments During Surgery

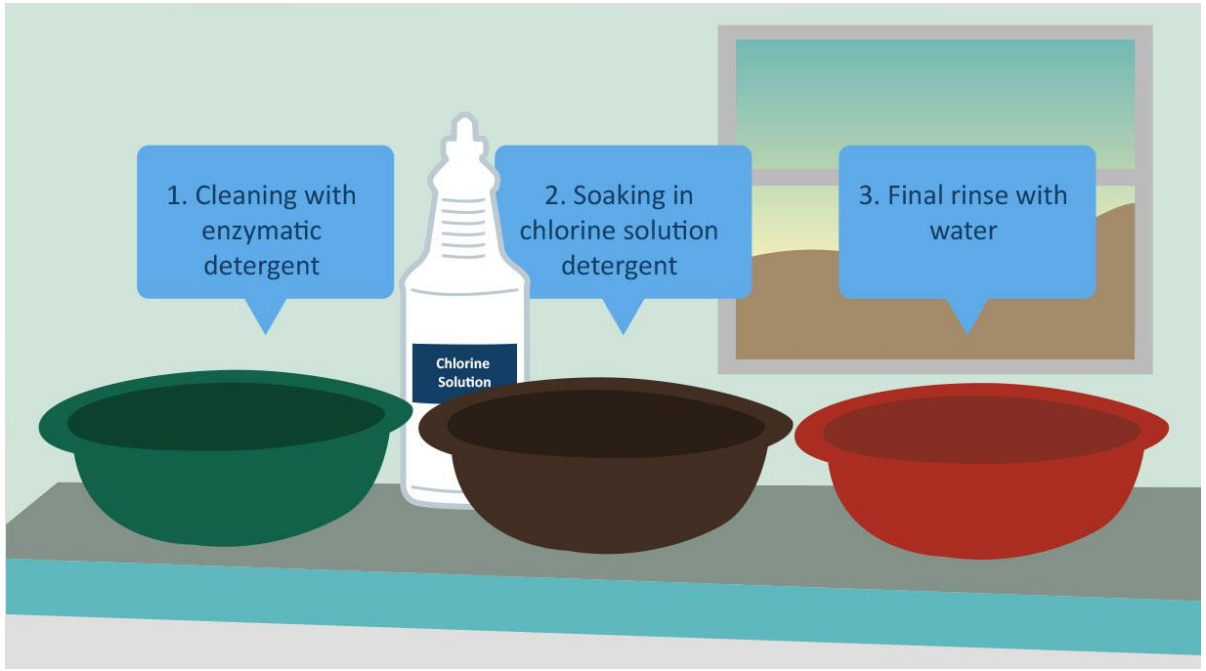
- Instruments used are wiped with sponges moistened with water
  - The Salt content of Saline can corrode instruments, so water should be used
- Suction tips are flushed with water frequently
  - Any Instrument with a lumen (or is hollow) should be flushed
- Non-immersible equipment should be wiped down
- Sharp instruments should be separated to avoid injury
- At close of surgery, equipment is separated by category
  - Instruments usually returned to their original inner tray for ease of reprocessing

Transport of Soiled Instruments

- Use a case-cart system
- Sterile items are transported to the surgical suite before surgery
- Contaminated items loaded for transport to decontamination area
- Contain soiled items
- Cart is decontaminated in a designated washer
- Items transported by the surgical technologist
- Case carts should be labelled as either "clean" or "dirty" once soiled instruments are present
- A case cart should be closed when transporting dirty instruments for infection control

Instrument Cleaning and Decontamination

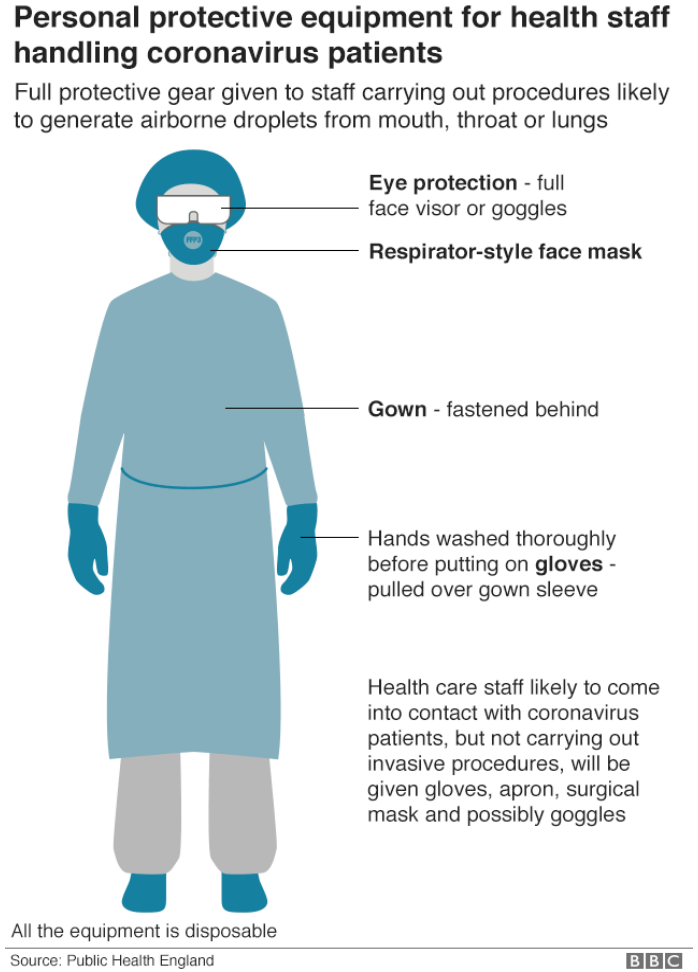
- **Separation for Cross-Contamination Prevention:**
  - Decontamination area isolated from clean processing areas.
  - Sinks designated solely for washing soiled instruments.
  - Equipment like brushes and stylets available in decontamination area.
- **Decontamination Area Facilities:**
  - Houses ultrasonic cleaner, washer-sterilizer.
  - Provides deionized/distilled water for rinsing and compressed air for drying.
  - Stocks chemicals like detergents, disinfectants, enzymatic cleaners.



Decontamination Attire

- Staff must wear **personal protective equipment (PPE)**

- **PPE Includes:**
  - Protective eyewear with side shields or full face shield
  - Face mask
  - Cuffed gloves approved for contact with chemical disinfectants
  - Full body suit or waterproof apron
  - Waterproof shoes and covers
  - Ultrasonic Cleaning

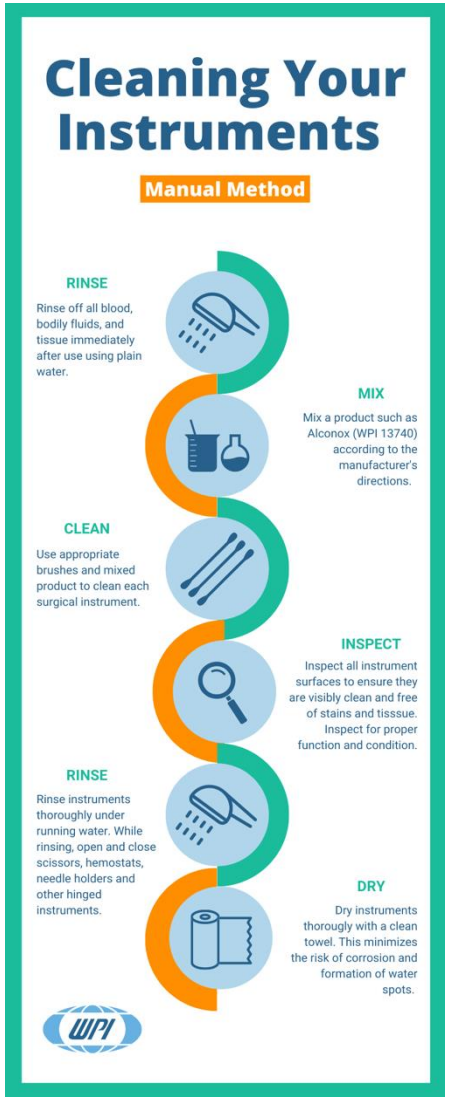


Sorting Instruments

- Items from the cart are grouped together by category:
  - Non-immersible equipment or instruments
  - Instruments with sharp edges or points
  - Small gaskets, screws, pins, and other small parts
  - Heavy instruments
  - Delicate instruments
  - Heat- and pressure-sensitive instruments
  - Instrument containers
  - Basins and cups
  - Tubing and other hollow instruments
  - Damaged instruments

Hand-Cleaning Instruments

- Performed on select instruments
- Use warm water and an enzymatic detergent
- Place instruments in a large basin or sink
- Submerge under water while cleaning
- Use brushes of appropriate size
- Clean items with lumens with narrow brushes
- Suction tips are cleaned with a stylet
- Clean non-immersible items in accordance with manufacturer's specifications



Types of Cleaning

- Ultrasonic cleaner
- Washer-sterilizer or decontaminator
- Special handling of ophthalmic instruments
- Instruments exposed to prion disease (These instruments are usually destroyed)

Instrument Inspection

- After decontamination, instruments are taken to the clean assembly area for sorting and inspection
  - Separate area from decontamination to prevent cross-contamination

Assembling Instruments

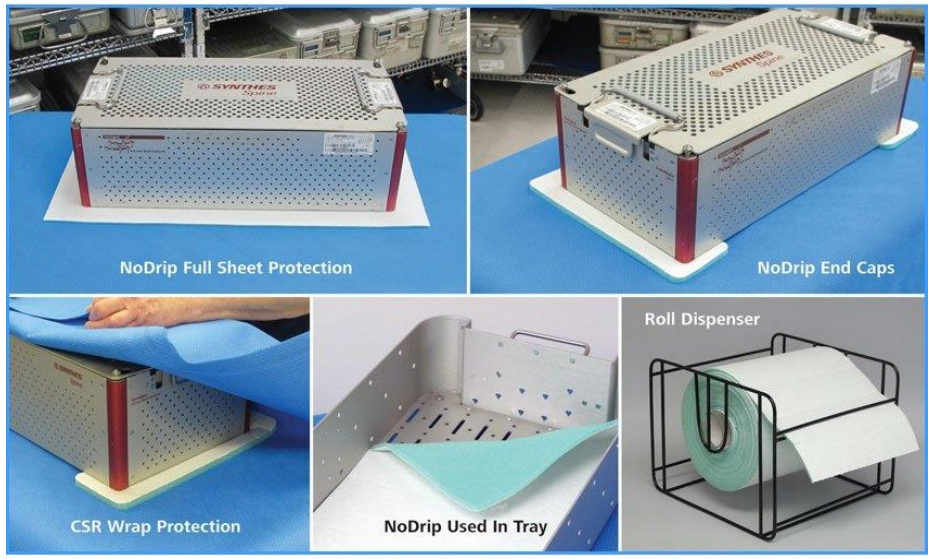
- Hinged instruments are opened (unlocked)
- Sharp or pointed instruments are turned downward
- Instruments with movable parts are disassembled
- Make sure no instrument tips are caught in perforations
- Place heavy instruments on the bottom
- Flush lumens immediately prior to sterilization
- Sets should not contain separate peel-pouched items
- Elastic bands should not be used
- Do not use nonwoven disposable wrappers as separator
- Container must be safe for surgical use

Packaging Systems Used in Sterilization

- Essential for items sterilized by various methods.
- Methods include pressurized steam, ethylene oxide, ozone, gas plasma.
- Wrapping ensures protection from contamination post-sterilization.
- Approved methods and materials are used for wrapping.
- Primary purpose: safeguarding sterilized items from contamination.

Qualities of a Wrapping System

- Allows penetration of the sterilant
- Allows dissipation of the sterilant
- Contains no toxic ingredients or non-fast dyes
- Does not create lint
- Resists destruction
- Permits complete enclosure of items
- Remains strong
- Convenient to work with
- Facilitates opening aseptically
- Cost-effective
- Matches the sterilization method



Wrapping Methods
(Slide 1 of 3)

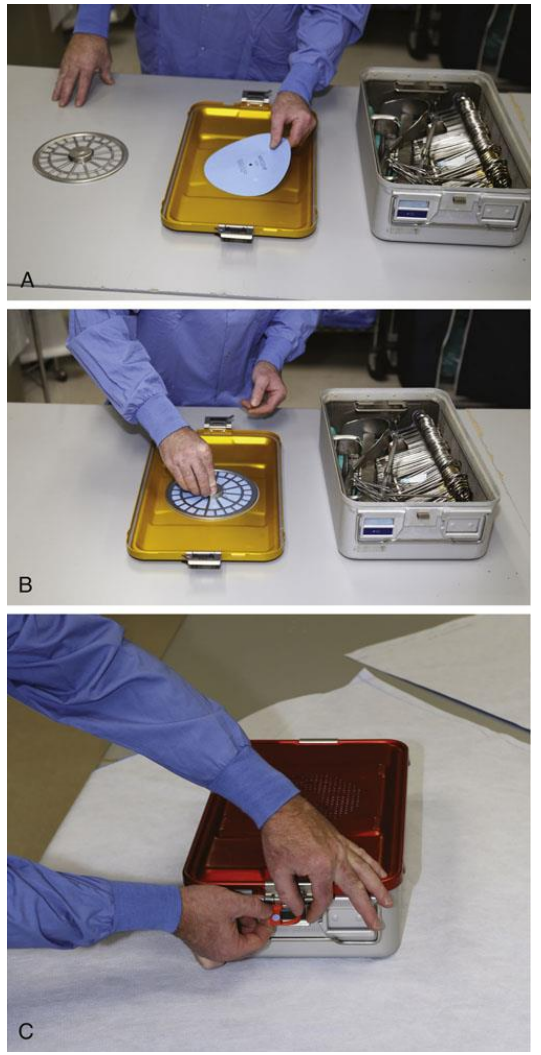
- **Cloth Wrappers:**
  - Woven from high-quality cotton or cotton-polyester blend.
  - Dense yet porous for steam or gas penetration.
  - Thread count ≥ 140, double thickness used.
  - Laundered before use, inspected for pinholes or tears.
- **Single-Use Nonwoven Materials:**
  - Made from spun, heat-bonded fibers like polypropylene.
  - Available in light and heavy weight, various sizes.
  - Lightweights require four thicknesses for protection.
  - Heavyweights for heavy instruments or flat items.

Wrapping Methods
(Slides 2 of 3)

- **Paper Wrappers Not Used:**
  - Cellulose paper not suitable, breaks down in sterilization.
  - Recoils when opened, difficult for aseptic distribution.
- **Peel Pouch:**
  - Combination synthetic and paper wrappers.
  - Made from medical-grade paper and polypropylene–polymethylene.
  - Various sizes, heat-sealed, or self-seal.
  - Not for heavy items, air evacuation needed, seal checked for air pockets.

Wrapping Methods
(Slide 3 of 3)

- **Closed Sterilization Containers:**
  - Safe for vapor, gas, and conventional steam sterilization.
  - Incorporate disposable filters and tamper-proof seal.
  - Follow manufacturer's recommendations.
  - Check filter expiration and sterilization method compatibility.



Process Monitoring (Indicators)

- Each form of sterilization uses integrators and/or indicators to verify the method was successful. These are placed in the trays, wraps, and packs to verify sterilization was accomplished. They should be checked when opening these items.

- Mechanical monitoring
- Chemical indicators
- Biological indicators
- Air detection testing

Watch the " Understanding Class 5 Integrators" video for an explanation and visuals of each of these

Understanding Class 5 Integrators Video

Understanding Class 5 Integrators Video

Summary of Video:

- Different types of Integrators will change when sterilization parameters are met
- Know what integrators look like when not processed and when processed

Monitoring Mechanisms – Mechanical and Biological

Mechanical Monitoring

- Modern sterilizers provide immediate feedback on parameters like time, temperature, and moisture.
- Monitoring output displayed via printouts, gauges, and digital readings.
- Important for detecting mechanical or digital malfunctions.
- Surgical technologists must know baseline readings for recognizing technical faults.
- Printouts recorded for validation during or after sterilizer operation.

Biological Monitoring

- Harmless bacteria enclosed in self-contained units.
- Placed in selected loads for sterilization.
- Bacteria cultured post-sterilization to confirm effectiveness.
- Weekly biological controls recommended for all sterilizers.
- Positive indicator results prompt withdrawal of items and notification to infection control.

Monitoring Mechanisms – Mechanical and Biological

Chemical Monitoring

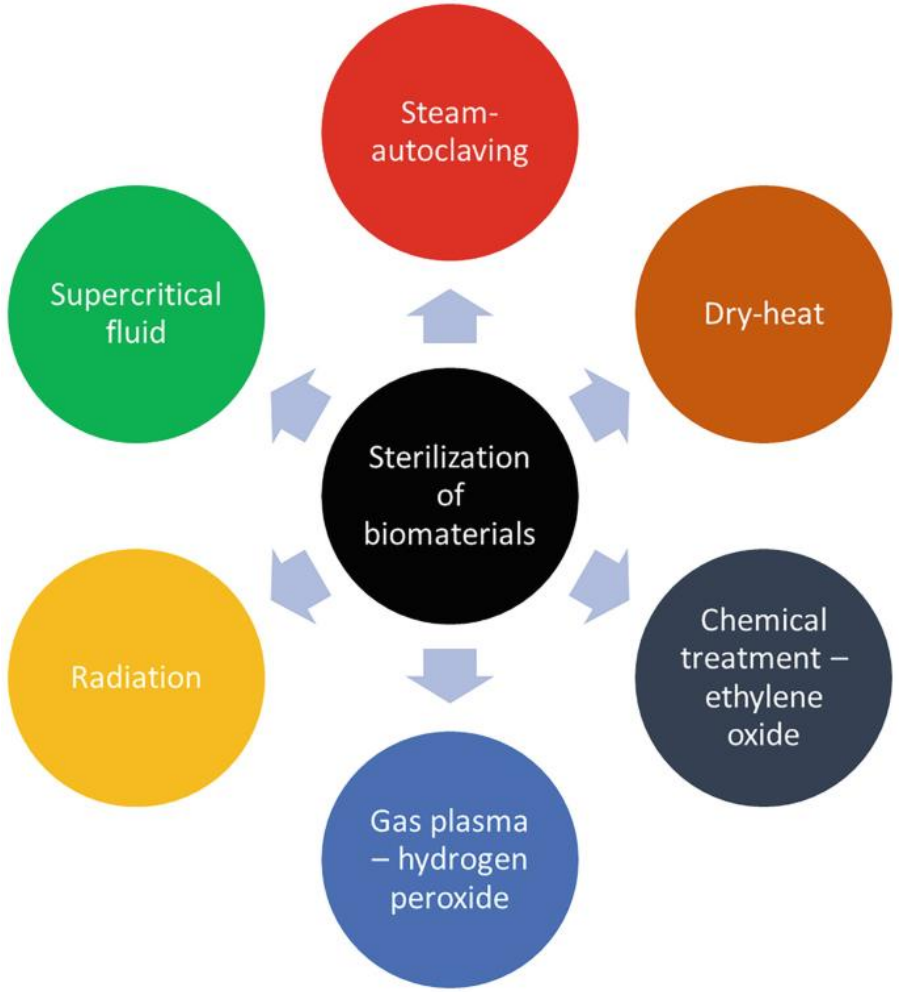
- Paper strips or tape treated to change color when exposed to sterilization process parameters.
- Routinely placed inside and outside packs to be sterilized.
- Monitor color change verified before proceeding with setup.

Air Detection

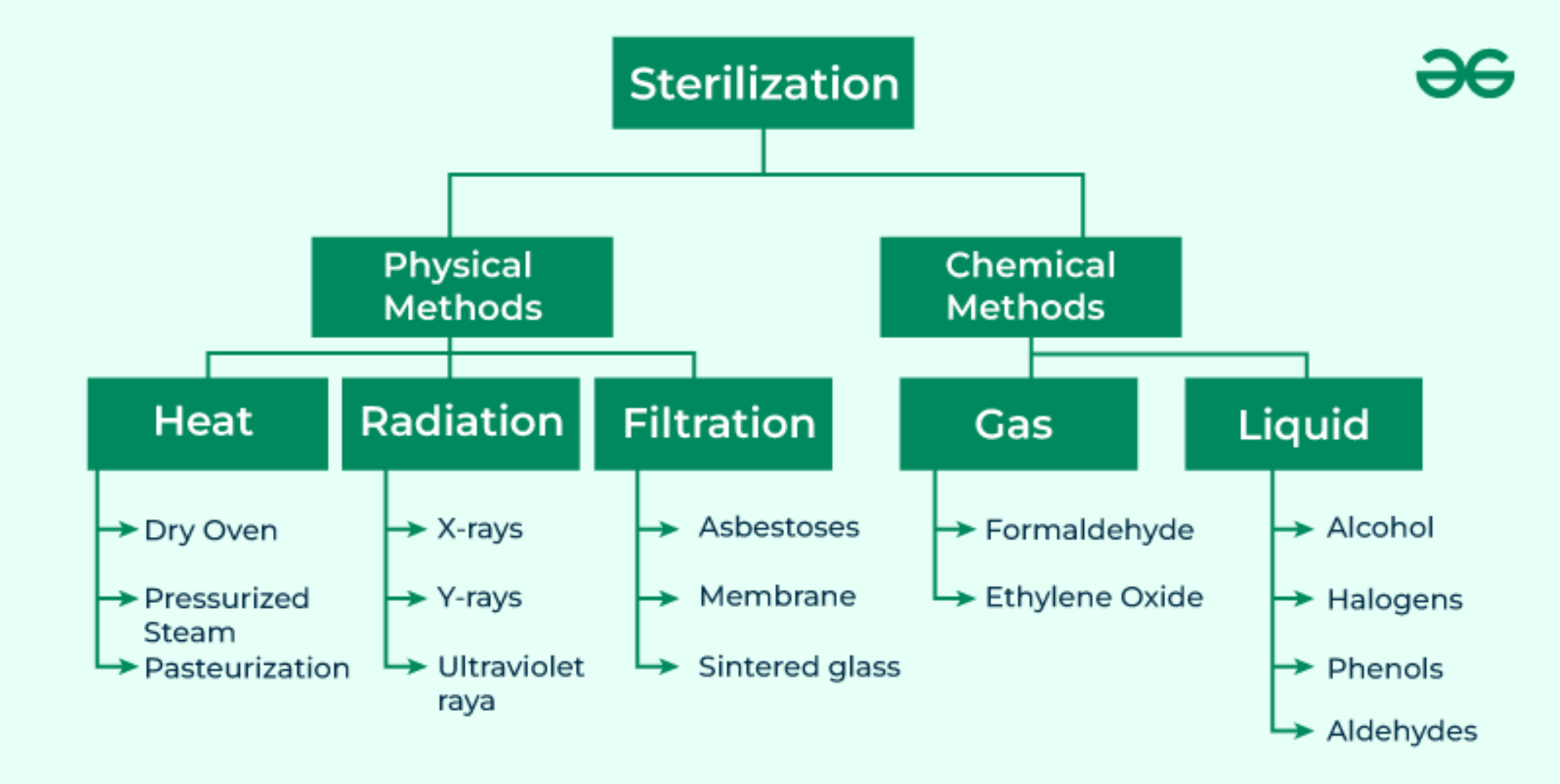
- Daily air removal test (DART) used to monitor high-vacuum steam sterilizers.
- Unsatisfactory results indicate issues with vacuum pump system or sterilizer door gasket.
- Unsatisfactory results reported to biomedical engineering staff for inspection.

Common Methods of Sterilization

- High-temperature steam under pressure
  - Steam Sterilization is the most common method
- Ethylene oxide (EO) gas
- Hydrogen peroxide gas plasma
- Hydrogen peroxide vapor
- Peracetic acid vapor
- Ozone
- Dry heat
- Ionizing radiation

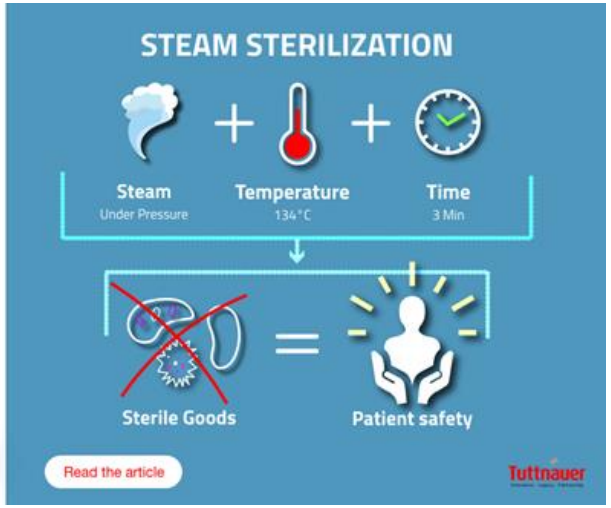


Sterilization Methods



Steam Sterilization

- **Steam Sterilization:**
  - Most widely used method in healthcare for effective sterilization.
  - Steam under pressure destroys microbes and spores.
  - Parameters include temperature, pressure, and exposure time.
  - Specific moisture concentration required for effective sterilization.
- **Sterilization requirements**
  - Temperature
  - Pressure
  - Exposure time



Item Selection and Steam Quality

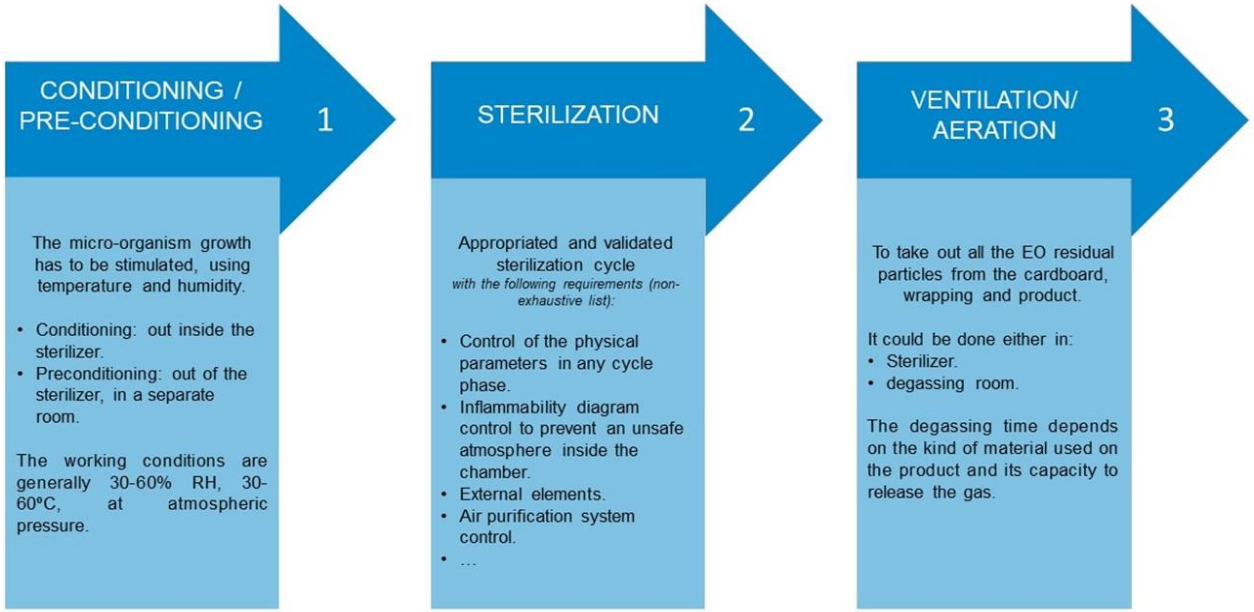
- **Selection of items for steam sterilization**
  - Items that can withstand high temperatures and exposure to steam
  - Follow manufacturer's instructions
- **Moisture concentration (steam quality)**
  - Water converts to steam at 212° F
  - Steam must contain more than 97% water
- **Steam Sterilization:**
  - Most widely used method in healthcare for effective sterilization.
  - Steam under pressure destroys microbes and spores.
  - Parameters include temperature, pressure, and exposure time.
  - Specific moisture concentration required for effective sterilization.

Immediate Use Sterilizers

- Also called "Flash" Sterilization
- Used in the operating room and in other areas of the hospital
- Recommended practices for immediate-use sterilization (AAMI)
- Removing items from the IUS sterilizer
  - Immediate use pan may contain water that was not entirely converted to steam. This is normally seen as a failure of sterilization with Steam sterilization, but may be acceptable with IUSS.
  - Pan will be hot, and protective gloves should be worn
  - Sterile persons should wait for the items to cool before adding to sterile field

Ethylene Oxide (EO) Sterilization

- Also referred to as "gas-ing"
- Used to sterilize objects that cannot tolerate heat and steam
- Used for micro-instruments and those with optical systems
- Highly penetrating
- Highly flammable liquid
- Kills microorganisms and their spores
- Operates at a lower temperature



Other Sterilization Methods

- Hydrogen peroxide gas plasma
  - Such as the "STERRAD" system
- Hydrogen peroxide vapor
- Peracetic acid vapor
- Ozone
- Dry heat
- Ionizing radiation

- **Note these methods may have different integrators to be familiar with**

Storage of Sterilized Goods

- Event-related sterility
  - Items to not "expire" based on time
  - Items are sterile as long as package integrity remains intact:
    - No Punctures or Tears
    - No Moisture penetration
    - Temperature/Humidity controls are constant in storage area

- Storage guidelines published by international organizations

Disinfection

- Partial destruction of microorganisms on inanimate objects.
- Different from sterilization as it doesn't eliminate all microbes.
- Spaulding system distinguishes between high-level and low-level disinfection (HLD and LLD).

Disinfection Types

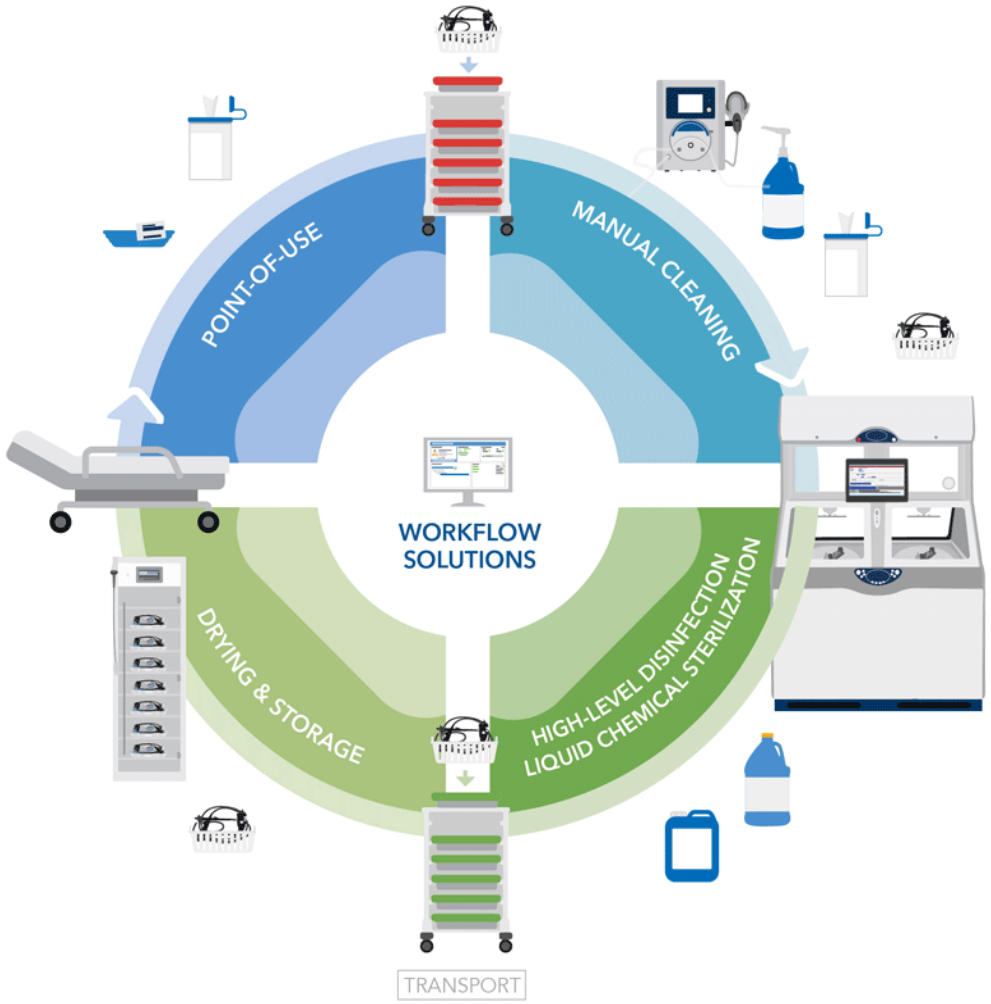
HLD

- Targets instruments for semi-critical areas.
- Utilizes specialized equipment and specific chemical disinfectants.
- Requires thorough cleaning before the disinfection process.
- Used for items like anesthesia equipment, endoscopes, and respiratory therapy equipment.

LLD

- For items in contact with intact skin, excluding mucous membranes.
- Utilized for environmental decontamination.
- Includes items like blood pressure cuffs, stethoscopes, and patient furniture.

High Level Disinfection Workflow



Types of Disinfectants

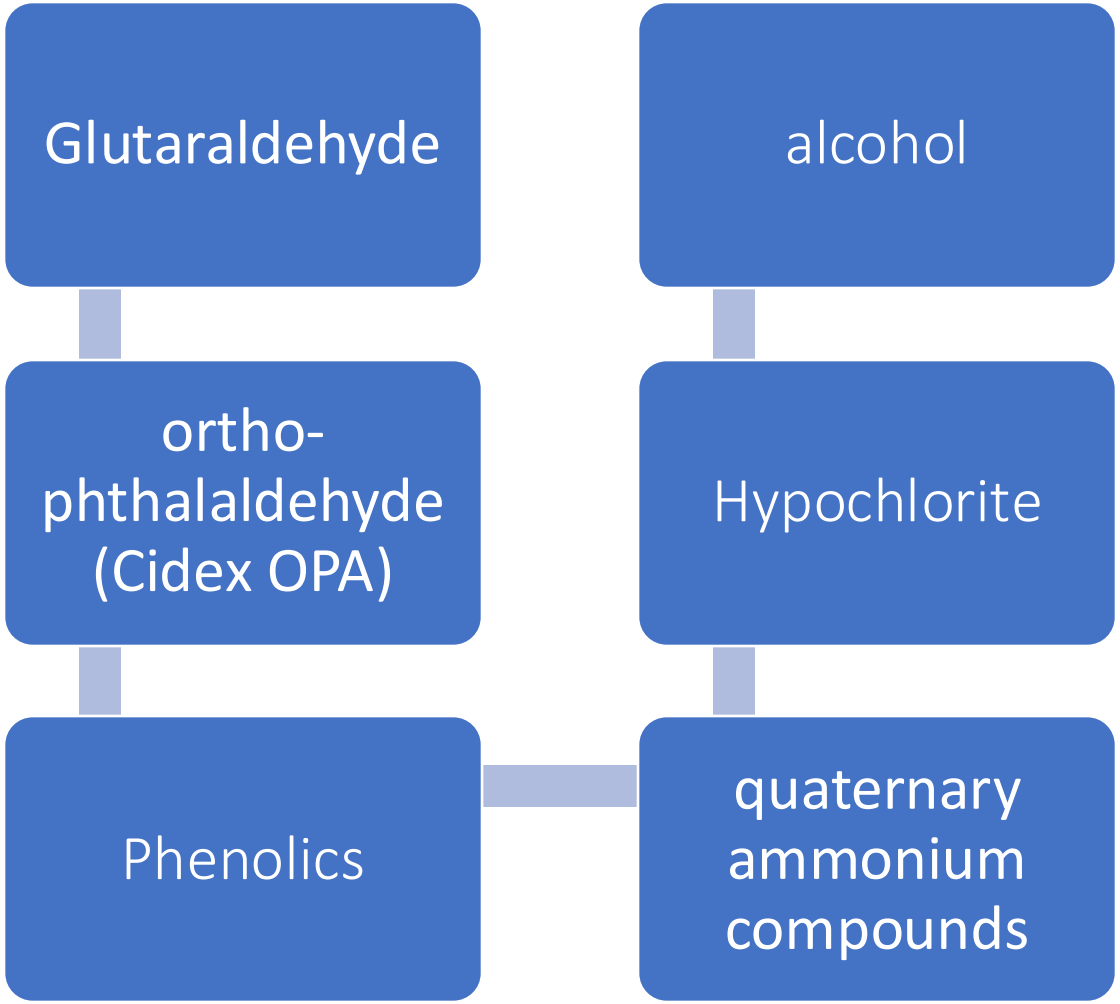
Environmental Disinfectants

- Contain enzymes or chemicals that alter cell proteins or dry out microbes.
- Commonly used for routine low-level disinfection.
- Enzymes and chemicals in these disinfectants help destroy or inhibit microbes.

Chemical Disinfectants

- Selection based on desired result and effectiveness.
- Factors affecting efficacy include concentration, bioburden, water quality, and organic matter presence.
- Disinfectant safety is crucial, with strict adherence to handling instructions and awareness of hazards.

Chemical Disinfectants for Medical Devices



Decontamination of the OR

- Before the workday
  - Damp-dusting of all surfaces
- During the surgery
  - Confirm and contain all potential contaminants
- Terminal cleaning
  - Completed after every workday

Watch the "SPD Behind the Scenes" Video for an overview of the entire process

SPD Behind the Scenes Video

SPD Behind the Scenes Video

Summary of Video:

- Decontamination: Clean Bioburden
- Ultrasonic Cleaning: Removing tiny biofilm that cannot be seen
- Mechanical Cleaning: Like a "Dishwasher" - Disinfection
- Clean Instruments now move to Clean side of SPD
- Assembly of Instrument Sets
- Prepare Container for Sterilization – Adding Integrators
- Sterilization with method for specific instruments (Such as Steam in Autoclave)

Read Chapter 10 from the E-Book

Read Chapter 10 from your E-Book to pass the upcoming quiz from **Surgical Technology - Elsevier eBook on VitalSource, 8th Edition.**

Click Here to access chapter 10!

Thank you!

Get ready for your quiz and rest of the activities now. Best of luck!

Congratulations!

Lesson 10 is complete.